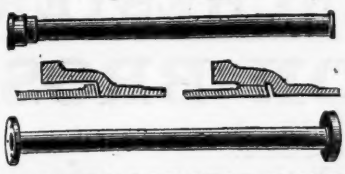
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1734.] LONDON, AUGUST 4, 1896. [48TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



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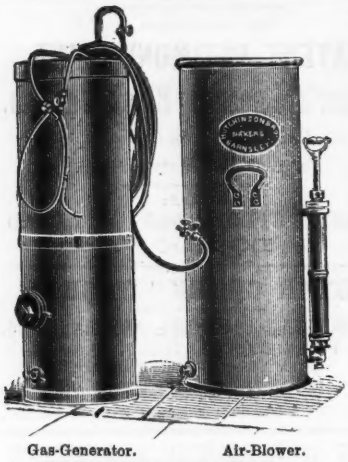

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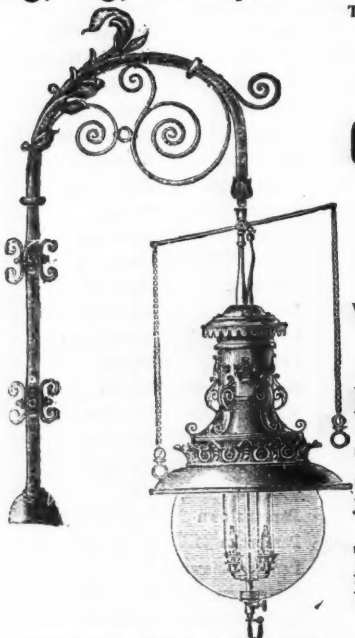

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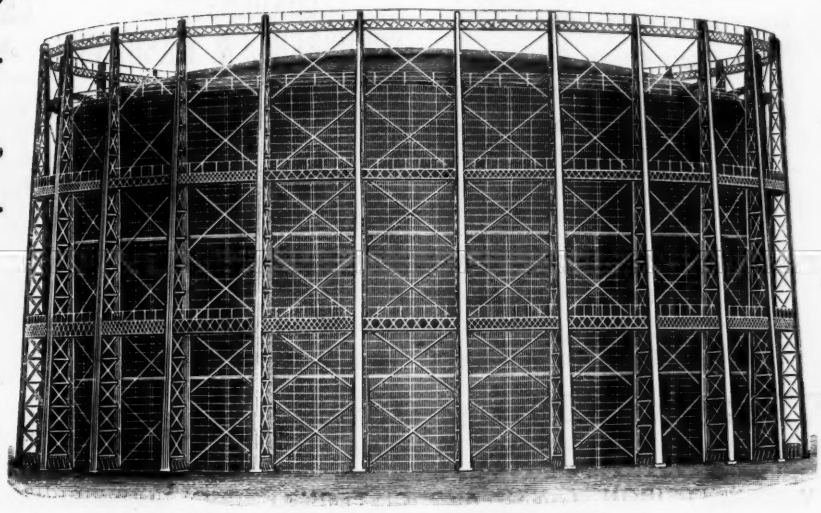

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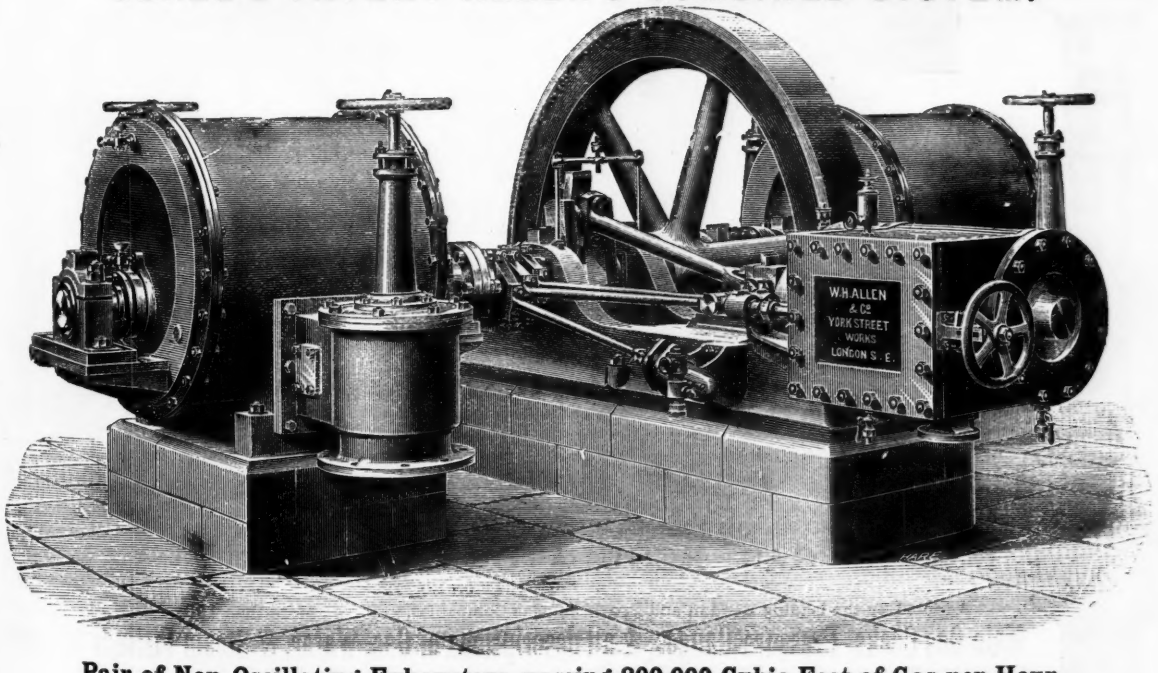

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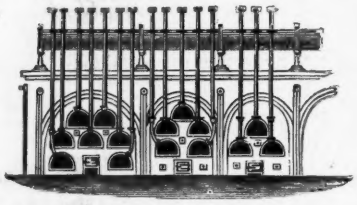

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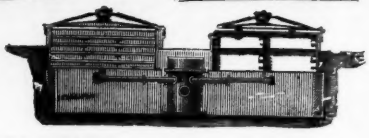

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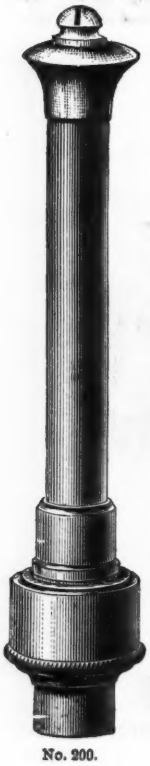

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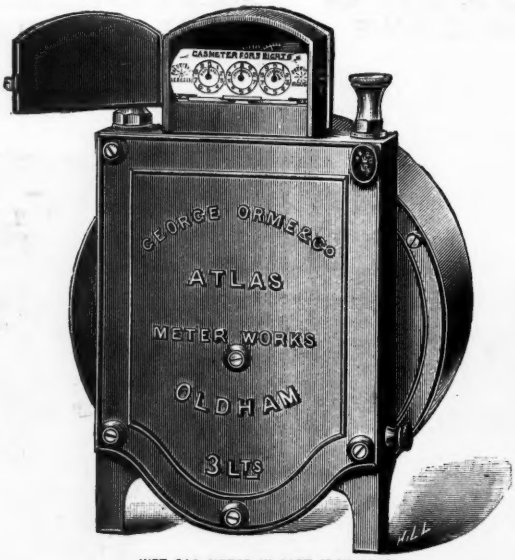

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DATE.	NAME.	No. of Lifts.	Lifts with Ropes.	Diam. in Ft.	Height in Ft. when full.
1894	Middlesbrough Corpn.	3 & Tank	All	184	120
1894	Sligo Gas Company	3	All	50	54
1891	Cie L'Union des Gaz Milan	2	All	116	46
1892	Bathurst (N.S.W)	2	All	82	36
1895	Athens (Greece)	2	All	64½	42
1890	Tyne Dock Gas-Wks., N.E.Ry.	2	All	71	42
1890	Newburn-on-Tyne	2 & Tank	All	47½	52½
1894	St. Austell Gas Company	2	All	34	34
1894	Birkenhead Corpn.	4	2 Top	160	120
1894	Cape Town (S. Africa)	3	Do.	50	48
1892	Nottingham Corpn.	4	1 Top	100	100
1892	Nottingham Corpn.	4	1 Top	90½	100
1893	Do.	4	Do.	90½	100
1893	Do.	4	Do.	90½	100
1890	Manchester Cor. (Gaythorn Wks.)	3	Do.	130	90
1890	Do. Do.	3	Do.	100	75
1890	Do. Do.	3	Do.	100	75
1889	Do. (Rochdale Road)	3	Do.	100	75
1891	Darlington Corpn.	3	Do.	100	73½
1895	Barrow-in-Furness	2	Do.	100	41
1889	Haslingden Union Gas Company	2	Do.	80	44
1894	Selby Local Board	2	Do.	50	36
1896	Stone Gaslight Company	3	All	42	48

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NAME.	No. of Lifts.	Lifts with Ropes.	Diam. in Ft.	Height in Ft. when full.
Falkirk Corpn.	2 with Cup & Tank	Both	130	40
Perth Corpn.	2 Do.	Do.	125	50
Barcelona (Spain)	2	Do.	98½	52
Perth (W. Australia)	2 & Tank	Do.	75	40
Derby Gaslight Co.	4	Top	125	102
Birmingham Corpn.	1		80	20
Malvern	2	Both	120	48
Preston Mills	2	Both	48	36
Brest (France)	1		43	13

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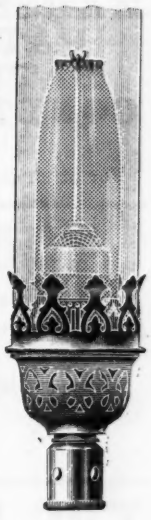

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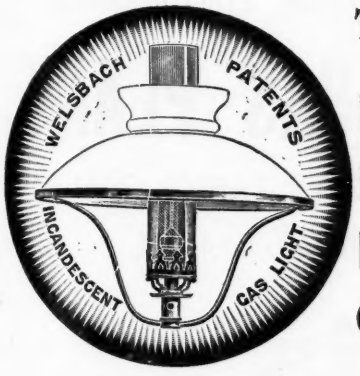

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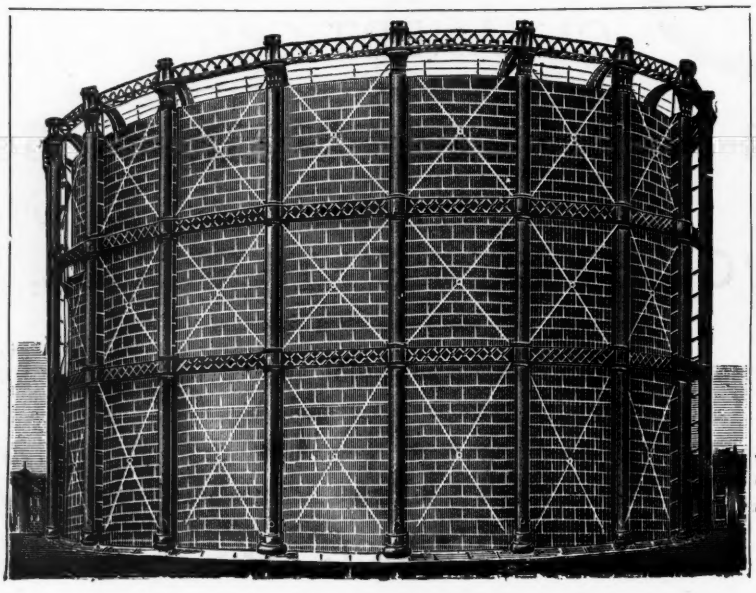

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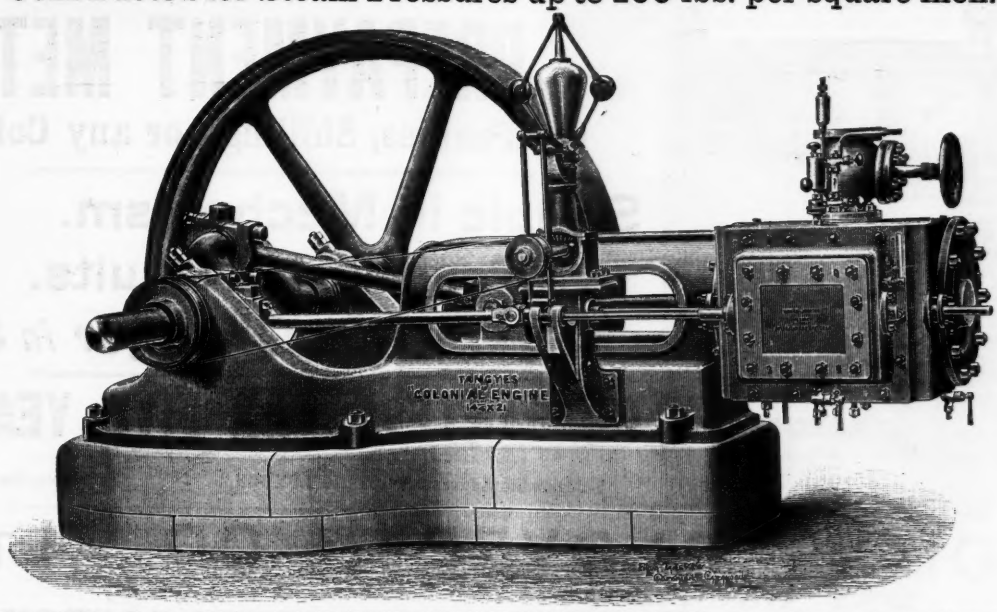

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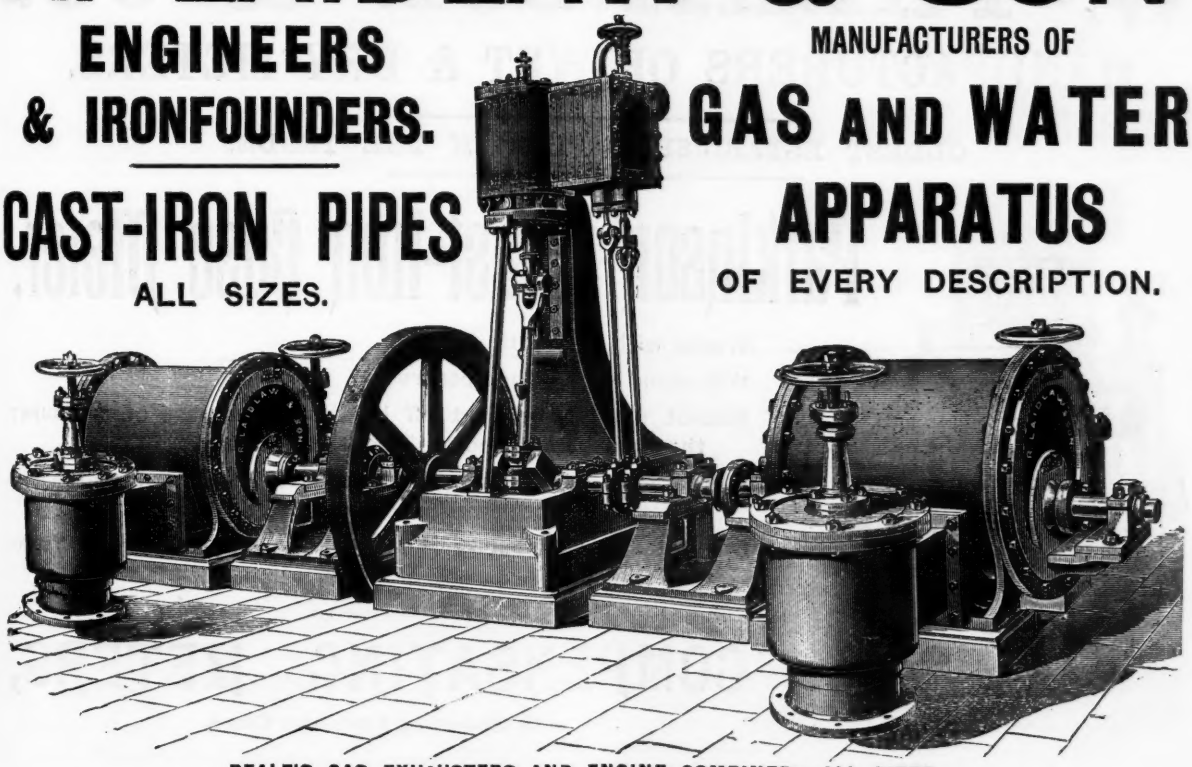

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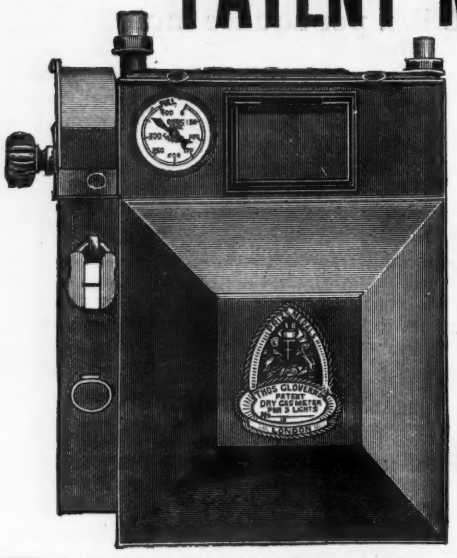

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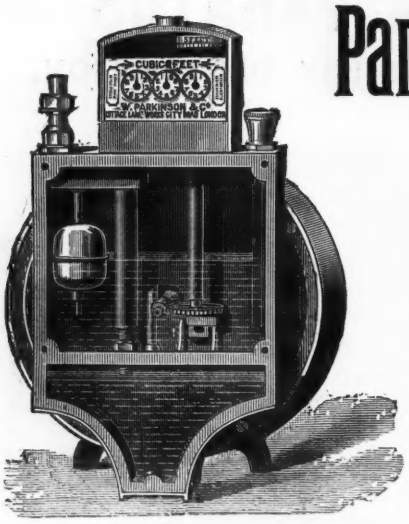

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EDITORIAL NOTES.

The Chartered Report and Accounts.

THE report of the Directors of The Gaslight and Coke Company, and the statement of accounts relating to the the last half-year's working of the undertaking, will be found in another part of the present issue of the "JOURNAL." As already announced, after providing for all fixed charges, the Directors recommend the declaration of a dividend at the full statutory rate of 12¾ per cent. per annum; carrying forward to the credit of the current half year the sum of £108,897—that brought into the present accounts having been £255,255. The sales of gas show a small, but positive increase on the large expansion of the corresponding half of the past year; the growth of business on the average of the two years being 3 per cent., which is referred to the constantly increasing use of gas for cooking and heating purposes, and the popularity of automatic prepayment meters, of which 42,333 are now fixed in the Company's district. The report confesses that "the unsatisfactory item" in the revenue account for the half year is that of coke, which shows a falling off of £60,577; and the Directors state that, "in "view of what appears to be a temporary excess of pro-"duction of coke over the requirements of its users in this "country," they "have entered into advantageous con-"tracts for its export on a much larger scale than at any "former period." This statement requires to be read in the light of information from other sources as to the past and present condition of the gas coke trade. The Directors report with satisfaction that they have bought their supply of coal at slightly cheaper prices than those paid under last year's contracts. A not unexpected announcement follows that £150,000 of ordinary "A" stock is to be issued, "in order to provide for the expenditure necessary "for an extension of automatic meter supplies and the "general increased demand for gas." This brief summary exhausts the new matter of the report.

The accounts show that the sum of £117,869 has been added to the net capital expenditure during the half year, of which £33,228 is for works and machinery; the balance being for new mains, services, meters, and stoves. This does not account for the automatic prepayment outlay, which appears in the general balance-sheet as a "fittings "account," to which £197,702 is credited. The "cash "at bankers" has fallen from £164,233 a year ago to £87,850; and the "amount on deposit at interest," which was at the same time £275,000, has become a blank entry. The usual charges for depreciation of meters and stoves, which amounted to £13,130 for the corresponding period of 1895, have vanished. Turning to the revenue account, it appears, curiously enough, that the returns from the sale of gas "at 2s. 10d. and 2s. 3d. per 1000 cubic "feet" are almost the same, within a small amount, as for the June half of 1895. Residuals, as already remarked, show a heavy decline, with the single exception of tar and its products. On the other side of the account, coals have dropped from £624,366 to £573,399. Carbonizing wages have risen from £152,537 to £161,245, which would seem to indicate that the machinery charged to the capital account is not of a labour-saving character. Repairs and maintenance of manufacturing plant stand rather higher; and the corresponding entry on account of distributing plant shows an increase of from £40,728 to £50,311. Rates and taxes have gone up another £7756. Altogether, while the revenue from all sources has dropped from £1,822,250 to £1,761,989, the gross expenditure on revenue account has been brought down from £1,273,363 to £1,261,445; thus reducing the profit balance from £548,887 to £500,544—a decrease more than accounted for by the collapse in coke. The rapid depletion of the balance available for dividend, notwithstanding the maintenance of the high price of gas, is the most salient feature of these accounts; and the absorption of capital resources comes next. Perhaps the advantageous exportation of coke may help the revenue. It must be admitted that there is ample room for this improvement—and plenty of coke to be had for those who want it; the stock being 201,456 tons, valued, even at the low ruling price, at £78,810. The form of the accounts does not show how much sulphate of ammonia is likewise awaiting advantageous exportation; but this and the tar products are put down at £249,278—a notable example of "matter in the wrong place."

We do not propose to comment at greater length upon

these accounts, which will probably be presented to the proprietors in the usual optimistic official fashion, and taken in the customary incurious manner, as though the maintenance in perpetuity of 12¾ per cent. dividends formed part of the general scheme of the universe in which the undertaking of The Gaslight and Coke Company bulks so largely. If contrary opinions exist in the world, the expression of them, either at the Horseferry Road meetings or in these columns, does not appear to penetrate through the veneer of complacency that shines with such mirror-like effulgence across the directorial table. Many warnings have been uttered in scornful, if not openly contemptuous, official ears, respecting the character of the Horseferry Road administration; and little or no good has come of them. But public duty constrains those who know the truth to utter it; and the course of time will bring the event to light in a manner that there will be no gainsaying. It is no part of the policy of the "JOURNAL" to indulge in alarmist views of the future of any gas undertaking; but it is impossible to glance over the accounts of The Gaslight and Coke Company for years past, and come to the conclusion that the position and prospects of the undertaking are strengthening with the course of time—to put the case in no stronger terms. It has been stated publicly, by a highly competent authority, that the Company cannot pay their way with gas at 2s. 10d. per 1000 cubic feet; and if any other construction can be fairly put upon the present accounts, this will, of course, be done at the general meeting, and we shall be glad to see it. As affairs stand at present, the alternative of raising the price of gas by another 2d. per 1000 cubic feet could not be entered upon lightly, without the excuse of dear coal, or for any other reason that the public and Parliament could be expected to understand. With every six months that passes, the opportunity for the justification of the last parliamentary settlement of the conditions under which the Company were entrusted with the gas supply of the greater part of London is running out. The irrevocable policy of amalgamation and concentration that was entered upon twenty years ago must be reviewed, if it cannot be reversed; and one need not be deeply interested financially in The Gaslight and Coke Company to wish that the statements of fact upon which such review must proceed were of a more reassuring character. It is not a question of gas-works management that has to be considered in this connection, but of the grand results of a policy of administration, following upon a statutory adjustment that appeared at the time the most expedient arrangement that could be devised in the public interest and in that of the proprietors of The Gaslight and Coke Company. So far as the latter is concerned, a 12¾ per cent. dividend may be regarded as amply justifying the wisdom and foresight of those who accepted the attendant risk of relinquishing the safeguard of the maximum 10 per cent. dividend. Again, so far as the same interest is affected, the policy of amalgamation has been vindicated. There is another side of the picture, however, which is presented by the entry recording sales of gas at "2s. 10d. and 2s. 3d. "per 1000 cubic feet," and the financial results thereof now exhibited. There is much to be said for the consolatory view that the immediate causes of the latter are possibly of a temporary and individual nature; and, in particular, that the adoption of the policy of holding stocks of residuals, announced by the Governor—Colonel Makins—a year ago, was a grave error of judgment that has been fraught with widespread and unfortunate consequences. This is, at any rate, the opinion of many of those irresponsible outside critics whose boldness in questioning the competency of the Horseferry Road administration is apt to be so resented by the heads of this "Department of State;" and it is unfortunately one that facts and figures rather tend to corroborate than to discredit. Would that it were otherwise, in the general interest.

The South Metropolitan Report and Accounts.

THE South Metropolitan report and accounts, given elsewhere, supply some interesting matter for comment. Notwithstanding the mild season, the increase of gas consumption in the district for the past half year was 2 per cent., which, coming upon the extraordinary 13 per cent. increase for the first half of 1895, makes a good average growth for the two years. This increase of business is ascribed mainly to the automatic prepayment meters, of which the Company had fixed 50,091 by the close of the half year. Notwithstanding this progress of the business, the general result of the half-year's working is not esteemed by the Directors as quite satisfactory, chiefly by reason of the decreased value of residual products; the falling off on this account being actually £23,747, to which has to be added the sum represented by the penny taken off the price of gas a year ago. Still, the Company are able to pay all interest and dividend charges after the rate of 13 per cent. per annum out of current profits, and carry forward a small balance; so that there is not much to complain of. It is remarked in the report that the apportionment of the dividend in accordance with the Scheme of Amalgamation will now be made for the last time. There is always a pathetic sound to this phrase; but in this particular connection it has no melancholy meaning. In bidding good-bye to the Scheme of Amalgamation, it is impossible to omit acknowledging that it has worked splendidly for the undertaking concerned, and not otherwise for the public. Now the Directors welcome the commencement of a new era for the Company. Their Bill has become law at last; and from the 12th inst. all division of interests among the stockholders will cease. Thenceforward all holdings will be in multiples of £5 of new 4 per cent. consolidated stock; the exact equivalent of the present 13 per cent. dividend being £5 4s. per cent. on this new or converted stock. The terms of conversion are stated in detail in the report. We heartily and sincerely congratulate the Company, the Board, and in particular the Chairman—Mr. George Livesey—on this opening of a fresh chapter in the history of the undertaking. It would not be easy to say how much the Company and the gas consumers of South London owe to Mr. Livesey's devoted labours and powerful initiative, always exercised on their behalf, and persevered in through good and evil report. But among these pre-eminent services, the conception and procuring of the latest South Metropolitan Act is not the least of the triumphs won by Mr. Livesey, and perhaps impossible to a weaker man or less capable administrator.

The accounts do not call for much detailed criticism. With gas down to 2s. 3d. per 1000 cubic feet again, the commercial development of the undertaking becomes a reflection of outside trade influences, directed and watched over by strenuous care and economical management. Mr. Livesey will probably have something more to say on the subject of residuals at the general meeting; yet it is of little use talking over the matter. The coke seems to be moving off, if the price is not good; the accumulated stock being less than half what it was at this time last year. Tar, on the contrary, is hanging on hand. There is a notable diminution in the quantity of unaccounted-for gas, which is very satisfactory. Coals cost the Company only £206,584, as compared with £223,528; and the amount paid for carbonizing wages is actually less. Altogether, the present report and statement of accounts are of a remarkable character, and should supply matter for a more than usually interesting address by the Chairman at the meeting to-morrow week.

An International Farce.

A LITERALLY "roaring farce" has been played in London during the past week by a strolling company calling themselves "The International Socialist Workers' and Trade "Union Congress." The performances began on Sunday week with a mass meeting in Hyde Park, "billed" as a "Demonstration in Favour of International Peace." Much trouble, spread over many months, had been taken by those who manage such things, in order to make it a big success. If in no other way, the gathering was indeed highly successful in exhibiting the hopeless character of the identification of Trade Unionism with Continental Socialism which the fuglemen of the former movement have brought about. Regarded as a means of hastening the era of International Peace, the value of the Hyde Park demonstration was hardly a sufficient return for the expense and trouble bestowed upon it. It duly passed, in a torrent of rain, a long-winded resolution declaring, among other things, that "every dispute between nations should be settled by "arbitration instead of by the brutality of force of arms." The force of this pious Sunday opinion is sadly weakened, as Mr. George Livesey pertinently pointed out in a letter to "The Times," by the fact that those who framed it are "the very men who so frequently refuse arbitration in their "labour disputes." This is merely another proof of the

inconsistency of what is called labour politics, as the holding of the congress is an example of the scandalous waste of Trade Union funds upon the rowdy theatricalities got up so frequently to no other purpose than the glorification of the professional performers. If Sunday's "resolution" was empty of good faith, truth, common sense, and practical statesmanship, the following day's "work" was a pitiful exhibition of the futility of bringing together such a gang of visionary agitators as constituted this egregious example of "Internationalism." And the days that followed were like unto the first. The hall in which the meetings were held presented day after day the appearance conventionally described as that of a "bear garden;" but, by all accounts, the monkey-house of any well-regulated zoological gardens would be a place of dignified quiet and decorous behaviour in comparison with this den of pacificators of Europe. What it was all about, what was the good of it all, and how much longer working people will remain content with being misrepresented in connection with such performances, are questions which men like Mr. Pickard, M.P., and William Thorne would be well advised in asking themselves before consenting to be mixed up with a repetition of these tomfooleries. Everybody knows pretty accurately what the objects of Trade Unionism are; and, whatever else may be said of them, it is impossible to surmise the nature of the connection that is supposed to bind them to the aims of the hare-brained, hysterical revolutionaries who thronged to London last week from the Continent, only to make themselves a laughing-stock to the universe. The tolerant British public amused itself over their turbulence and dementia; while the stolid guardians of the public peace did not take the trouble to interfere with the rampant Internationalists, beyond causing them to "pass along" when they overflowed into the street. Such a gathering of human explosives would probably have disturbed the repose of any Continental Minister of the Interior; yet in London it did not give an hour's extra work to a sergeant of police. Still, the question must be asked of the British Workman, even when belonging to the minority of those who have relinquished their birthright of liberty at the bidding of the Trade Union leaders, whether he thinks this sort of thing "good enough" to pay for out of his earnings. It is certain that if he will not "pay the piper," the members of the stock company of strolling socialistic players must soon stop dancing.

A Point of Trade Union Practice Defined.

While the International Socialists and Trade Unionists were enjoying themselves in the manner discussed in the preceding paragraph, one of the methods of practical Trade Unionism was engaging the attention of Mr. Justice Grantham and a special jury in the dim recesses of the Royal Courts of Justice. An action was brought by a firm of decorators and one of their foremen, against several secretaries of Trade Societies and others, for damages and an injunction to restrain the defendants from interfering in various ways with the plaintiffs' business. The trouble arose in the usual way over a trade dispute and the acts of "pickets." The dispute itself grew out of the dismissal of a workman for incompetency, to which the Societies objected, and ordered a strike, with the object (which was not attained) of forcing the firm to obey their behest in the matter. In the course of the consequent proceedings, it was alleged that the Trade Unions attempted to deprive the plaintiffs of their means of gaining a livelihood. It is unnecessary to go into the details. The plaintiffs' Counsel stated that "this was one of the worst cases of the kind ever put before a jury;" and the jury gave his clients the substantial solatium of £300 damages for the firm, and £20 for the foreman, while the Judge pronounced the injunction asked for. It was the old story of the difficulty of practising picketing in a legal manner, complicated by a misunderstanding of what is legal picketing. The Societies concerned had regular printed instructions for the conduct of this operation in strike tactics, which stated that pickets are to "peaceably persuade men not to "work." We venture to declare that nine workmen out of ten to whom the operation is familiar, would regard this as coming well within the limits of the law of the subject. May not anybody, meeting another body, ask this body to be so kind as to "play" instead of work? Mr. Justice Grantham, however, finds that the law that sanctions men loitering in the neighbourhood of a shop or job in regard to which a strike is in progress, with the object of picketing the premises, expressly enjoins that the pickets are to restrict themselves to the procedure mentioned in the Act—namely, obtaining or communicating information. Hence the "strong pickets," of which so much is heard on these occasions, can do no more without breaking the law than can a single man; and inasmuch as a number of idle loungers are more likely to proceed to illegal measures than a single individual, the latter agency is the safer. The case is noteworthy as another commentary upon the valuable leading instance of *Temperton v. Russell*, which is the authoritative judgment upon these points of strike procedure.

WATER AND SANITARY AFFAIRS.

The President of the Local Government Board, in replying to sundry questions in the House of Commons as to the restrictions in the East London water supply, has been placed under the necessity of refuting fallacies which have been often demolished before, but which seem to be incapable of complete extinction. There is the notion that in East London the supply by meter never fails, because it has to be paid for *per quantum*. Mr. Chaplin explains, as informed by the Company, that there is not the slightest foundation for such an idea. There is also, as might be expected, a resuscitation of the old argument that payment by rateable value should be superseded by a charge founded on the quantity of water consumed. That is to say, the entire supply should be by meter. Of all insane proposals, this is about the worst; and Mr. Chaplin very properly told the House that such a plan would increase the charge for water supplied to the crowded dwellings of the poor, while it would reduce the charge for the supply furnished to the superior class of houses. To this it may be added that the poor, paying *per quantum*, would use as little water as they possibly could, whatever sanitary risks might thereby be incurred. Concerning payment on rateable value, Mr. Chaplin remarked that there were cases in which the assessment went down—making the Company the losers. We should like to know on what basis the County Council are prepared to charge for the supply, should they ever take the place of the Water Companies? They have not yet promised to give water for nothing. On the contrary, there is the probability that the charge will become heavier, supposing the Council to obtain possession of the supply.

How to give a quart of water when they have only a pint to draw upon, or how to turn the water on for twenty-four hours when they have only enough for six, is the kind of problem which presents itself to the Directors of the East London Company. Supposing the local Vestries could march in and take possession of the water-works, does anyone imagine that the supply to the consumers would be improved? The Company are doing their utmost, and Mr. Chaplin is looking well after them. To throw all the water away at once, would not be prudent, even though rain may be falling. The publication which assumes the title of "London" has been studying the problem, and has arrived at the conclusion that the Company are suffering "not so "much from the absence of storage reservoirs as from the "absence of adequate sources of supply." Yet this logical organ disputes the statement of Mr. Bryan, that, owing to the drought, the flow of the River Lea this year is 40 per cent. less than it was last year. On the authority of Mr. Corble, the Clerk to the Lea Conservancy, "London" asserts that there is nothing the matter with the Lea, the chalk springs having the effect of keeping the river "up to "its standard level." So far, then, the sources of supply do not fail. After declaring that "the absence of storage "reservoirs" is a minor question, "London" goes back on itself by saying, "the fact is the East London Company for "years have neglected to extend their works with the growth "of the eastern districts." But will "London" help them to "extend their works?" Will the County Council be equally complaisant? Has Parliament favoured such extension? So it is. If the Companies propose new works it is objected that they are simply seeking to enlarge their capital account. If anything goes wrong, the Companies are abused for not constructing the works, and are charged with a selfish desire to augment their dividends.

It is interesting to read in "London," concerning the Lea, how "the wonderful springs that abound in the chalk

"valley keep the river replenished for weeks together when "there is an absence of rain." We put this in contrast with a letter which appeared in "The Times" last Thursday, showing how at that date the streams in the Welsh hills which appertain to the Birmingham catchment area had run dry. "That is to say," observes the writer, "were London dependent upon water from the Welsh hills, "we should be reduced to living upon the visible stock of "water in the storage reservoirs." The explanation follows that the impermeable primary rocks of the Welsh hills throw off the rain which falls upon them, unless it is impounded; whereas the great masses of porous limestone in the Thames Valley provide a natural underground storage. Utilizing this resource, London is safe, even in times of exceptional drought. It thus becomes a question of "works" for the Metropolis, the sources being close at hand and abundant. On Friday, the welcome intelligence was imparted to the House of Commons by Mr. Chaplin, that an arrangement was made by which the New River Company would provide the East London Company with an additional supply of 3 million gallons daily. The House cheered the announcement. On the previous day, a public meeting respecting the East London supply was held in the drawing-room of Toynbee Hall, the outcome of which was a proposal to send a deputation to wait on Mr. Chaplin—a decidedly superfluous step, seeing it is acknowledged that the head of the Local Government Board is already doing his very utmost in regard to that matter.

PERSONAL.

Mr. Jacques Abady, of Messrs. Alexander Wright and Co., has been elected an Associate Member of the Institution of Mechanical Engineers.

Mr. F. Gibson, formerly of Carlisle, has resigned his appointment as Engineer and Manager of the Chelmsford Gas-Works, which he obtained in October last year.

M. Berthelot has received, not as ex-Minister for Foreign Affairs, but as a chemist, the Grand Cross of the Legion of Honour. On Monday last week he opened the second International Congress of Applied Chemistry in Paris.

Many of our readers will, we are sure, share our regret at learning that Mr. R. Mitchell, of Edinburgh, has been obliged, on account of his health, to take a long holiday. He arranged to leave Edinburgh last Friday for the Cape; and he is to be away for three months. Unfortunately, Mr. F. T. C. Linton, of Leith, Mr. Mitchell's colleague, is also lying ill at Harrogate; but he is reported to be recovering.

The partnership which was for some time carried on by Mr. John Coates, Mr. George Swinburne, and Mr. Cuthbert R. Lee, and subsequently by Mr. Coates and Mr. Lee, under the style or firm of "J. Coates and Co.," at Suffolk House, Cannon Street, E.C., and also at Melbourne and elsewhere in the British Colonies, has been dissolved by mutual consent as from Dec. 31, 1895. The London business has been taken over and will be continued by Messrs. C. R. Lee and Co. at Suffolk House.

An Enormous Cob of Cannel Coal was recently raised from the Abram Collieries, Wigan, and sent by train to the Alexandra Dock, Liverpool, for shipment to Boston. It is said to be the largest block of coal ever dug from the earth, and weighs over 12 tons. It took nine months to hew out of the seam. It is said that the cost of obtaining it was £1000, or about £83 per ton. When raised the cob was enclosed in a case of planks, the weight of the cob and case being 13 tons 11 cwt.

Gas and Electric Lighting in Belfast.—The summer meeting of the Institution of Mechanical Engineers, which was held in Belfast last week, under the presidency of Mr. E. Windsor Richards, was of more than ordinary interest to our readers from the fact that the gas and electric lighting undertakings of the Corporation were described by the two gentlemen most competent to deal adequately with these important works—viz., the Corporation Gas and Electrical Engineers. In a very interesting paper, Mr. James Stelfox traced the growth of the gas-works from the early years of the century (for the subject of gas supply received attention in Belfast as far back as 1817) down to the present time, when they have become conspicuous for their equipment of the latest type of gas-producing plant. He stated that fifteen years ago the works were pronounced commercially dead; yet the consumers have continued to demand from them all the work and service expected only from a flourishing vitality. Mr. Victor A. H. M'Cowen gave a not less interesting account of the electric lighting works, though, of course, he had to discourse on an undertaking of yesterday as compared with that supervised by his colleague. Both papers demand more than this brief notice, as they were timely and valuable contributions to the proceedings of the Institution.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 230.)

Things were very flat for the most part on the Stock Exchange last week. Dulness prevailed at the opening, especially in the American market, owing to the action of the Silverites. Later on, the Foreign Market went very heavily; and the South African market was depressed. The cause of this had its origin in Paris, where there has been a deal of rampant speculation; and, as usual, when the "weak bulls" began to give way, things came down with a run. It was feared that awkward results might be forthcoming here; and the settlement was looked forward to with some anxiety. A better feeling, however, prevailed before the close, when it was found that the selling was stopped, and that the settlement was likely to go through without serious difficulties. Prices have naturally suffered some setting back; but they will be all the better later on for the atmosphere having been cleared. Business in the Gas Market was only moderately active; no great degree of animation being probable just in advance of a holiday. And there was very little change made in any of the prices; but such as it was tended in the usual upward direction. In Gaslights, the "A" stock was firm and steady at the old figures—closing strong when the accounts for the half year came out, and showed a state of affairs more favourable than might have been expected. Hardly anything was done in the secured issues; but all that were dealt in commanded good prices. South Metropolitans were very quiet; only two or three transactions being marked in them. Commercials were rather more active; and the old stock gained a point. The Suburban and Provincial Companies exhibited their usual quiet attitude; and the only move was a further rise in Alliance and Dublin. The Continental Companies, too, were extremely inactive; and their quotations remained unchanged. Among the rest, Bombay had a further rise, and has now attained an extremely high figure. San Paulo and Buenos Ayres advanced a little; but Belgrano receded. Business in Water was of the usual quiet type. Movements in price were irregular; there being about an equal number of rises and falls.

The daily operations were: The week opened with very limited business in Gas; but prices all round were good. The only change was a rise of 1 in Commercial old. In Water, Southwark fell 1. There was much more activity on Tuesday; and prices were good, though unchanged, except for a fall of ¼ in Belgrano. In Water, Southwark preference gained 5. Business fell quieter again on Wednesday, and showed no particular feature. San Paulo rose ½; and Buenos Ayres debenture, 2. In Water, East London receded 1; and Southwark "D," 5½. Thursday was a more active day, and good prices ruled. Alliance and Dublin new moved up ½. In Water, West Middlesex advanced 1; but Lambeth fell 2. Friday became quiet; and quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

American Experience of Municipal Electric Lighting—The Way of Illusion—The Disillusionment.

It may be doubtful how much importance ought to be attached to the recent Street Lighting Convention, held under the auspices of the Local Authority of the city of New Haven, Connecticut; but it is certain that this gathering was the occasion of the publication of much interesting information concerning the experiences of some United States municipalities in the matter of electric lighting. It is unnecessary to recapitulate what is generally known in regard to the feverish haste with which the public use of electric lighting was forced on in the States, at a period when the British attitude towards the new system was caused to be one of reserve by the stringent provisions of the first Electric Lighting Act. From what transpired at the New Haven Convention, however, it may be gathered that our frequently expressed view, that this legislation was beneficent, was justified. To say as little as possible about the blight of municipal corruption and consequent inefficiency which the political system of the nation has brought upon so many of the cities of the United States, it appears certain that in most places where the local authorities were prevailed upon to undertake public electric lighting, the result has been anything but satisfactory. Many of the the towns which made this mistake have been compelled to abandon the enterprise—of course, at a great sacrifice. Their experience in this regard strikingly anticipates that which it is to be feared not a few English municipalities similarly affected will have to undergo, as they are already realizing the earlier phases of the same painful process of disillusionment. The American examples are exaggerated, doubtless, by the prevalence of the municipal evil already mentioned, and by the circumstance of their ventures dating from an era when electric engineering was more experimental than that which has of late years been at the service of English municipalities. But these defects, grave

as they are, would not have brought public electric lighting in the States into such disrepute had it not been for the concurrent existence of commercial weaknesses of the same character as those which afflict the home local authorities. These are, shortly, the inherent costliness of the service, particularly where the demand for private lighting is small; the reluctance of local authorities to face and publish this fact; and the propensity of the same authorities to put off the day of reckoning by refusing to make proper provision for the depreciation of their plant. What makes American experience in these regards so instructive is the fact of its having run long enough for these causes of disaster to have their full and inevitable effect.

Whatever may have been the secret motives of those United States municipalities which adopted public electric lighting, they at least put forward at the time the same excuse, of certain expectation of making a profit and sparing the local rates, as we are so familiar with at home. They had, moreover, the same grounds to go upon. They were advised to go into the business by more or less eminent and impartial technical authorities; and they went about in deputations seeking corroboration for these promises from public bodies that had already made the plunge. In the words of one of the papers read at Newhaven, "committees are appointed by city authorities to investigate and report; the men composing these committees are men engaged in various branches of business (all, no doubt, fully posted and successful in their own line of business, but utterly ignorant of the plans and practical part of electric lighting) who therefore must rely solely upon the statements of employees and managers of other city plants—men whose position depends upon making a favourable report." So another set of sanguine "progressives" are duped, and another municipal electric lighting undertaking is started with the customary flourish of trumpets. For a time all goes swimmingly—after the initial troubles are surmounted, and the unpleasant discovery that the venture has run into a great deal more capital than was expected has been taken as hopefully as may be. The town is lighted by electricity; the community has been lifted into the ranks of go-ahead, up-to-date towns; and the local newspapers publish glowing accounts of the saving that is being effected in the public lighting service—not absolutely, of course, but relatively to the splendid flood of light that bathes the streets in latter-day effulgence.

After a while, however, a change comes o'er the spirit of the dream. The once flattering newspapers begin to question the accuracy and completeness of the accounts published by the electric lighting department of the Corporation. "The 'Argus News,' of Crawfordsville, says: 'What our electric light plants cost is something past finding out. At least, so far, no one has been able to find out. The 'Argus News' for a long time took it for granted that everything was all right; but a little investigation goes to show that everything is all wrong." What applies to Crawfordsville is true of other places where the local authority has discovered that it is paying too much for its whistle, and is afraid to confess it. At last the process of hiding away and covering up cannot be practised any longer. Chicago may flatter itself that its electric lights cost the merest trifle, and may tell everybody so who takes the trouble to inquire. A new comptroller comes into office; and, being free from the personal complicity of his predecessor in the delusion, he insists upon the taking of a rigid account, which discloses the fact that street arc lights supposed to cost the city $69·35 each per year—how significant is the carrying out of the figure to the second place of decimals!—in reality cost over $165. This may not matter much in Chicago; but there are many less wealthy communities where, after much the same kind of experience, a sudden stoppage of the lighting has revealed the additional fact that boilers have collapsed, dynamos burnt out, steam-engines broken down, and that there was no money to replace them. Naturally, the small places come to grief first. Then the last chapter opens. So we read of a typical instance where the Common Council of a city, after receiving a report from their Electric Lighting Committee to this effect, took a vote of the ratepayers on the question of selling what remained of the plant, and relinquishing the business; and they were authorized by an overwhelming majority to act upon the recommendation.

NEW USES FOR METALLURGICAL COKE.

Those who are interested in the development of the coke industry, whether for its own sake or with regard to its bearings upon gas manufacture, may be commended to a study of the subject contributed by Mr. John Fulton to the May number of the "Engineering Magazine," in which it is treated at some length, and with ample illustrations of the latest methods of coal carbonization in mass. The author begins by remarking philosophically upon the indifference displayed by the world, even of technicians, to the elements that underlie the production of those ultimate results which represent the material resources of civilization. When people regard such a concrete product of the age as the railway service, for example, they are apt to think only of the coaches, the engines, the permanent way, and such like ultimate expressions of railway engineering. They rarely think of the metallurgical and structural elements—the cement, the steel, the fuel which in the last resource render these finalities possible. One of the fundamental units of modern engineering resources is coke. If anything were to happen to destroy or seriously cripple the coke industry, the effects would be felt over a wide range of manufacturing industries and public services which do not exhibit on the surface any connection with this particular description of fuel. So far as we can see at present, nothing could take the place of coke in modern metallurgy. Mr. Fulton observes that "if iron and steel manufacturers were compelled to go back to the exclusive use of charcoal fuel, an immediate and large reduction in output would follow, with most alarming consequences; rapid depletion of the forests would ensue, ending in their exhaustion. Even by the use of the more compact mineral fuel anthracite coal, with its slow combustion in smelting operations and increased costliness, the present output of metals could not be maintained." In the United States, the employment of coke in metallurgy is so great as to render the term "Coke Era" even more applicable to the present time than the more commonly used term the "Age of Steel."

The history of coke manufacture repeats a phenomenon of universal occurrence. It did not proceed by the origination of a new method, but by the adaptation of the older one of wood charcoal burning, which, in its turn, may well have had an accidental origin in the spontaneous ignition and smouldering of an accumulation of small pieces of wood. Thus the first coke was made by the slow burning of heaps of coal smothered with fine coke dust, or breeze. From this primitive method to the bee-hive oven was one step, which was followed by the vertical, and by the shaft oven or retort. "The position of the coal in coking in these ovens has been illustrated by the use of a common red brick. Laid on its broad side, it represents the coal in the bee-hive oven; on its narrow side, the vertical family of coke-ovens; standing on its end, the shaft or Appolt type of oven."

Mr. Fulton is careful not to depreciate the bee-hive oven, and describes some excellent practice made with ovens of this type in the Connellsville region, Pennsylvania. The theoretic yield of coke from the coal carbonized here is reckoned at 67·27 per cent. of the raw coal, which shows by analysis about 60 per cent. of fixed carbon and 32 per cent. of volatile matter, with 7 per cent. of ash. The average yield of 48-hour coke, watered in the oven, is 67·39 per cent. About 8 per cent. of the carbon is consumed in the oven; but this loss is fully compensated by deposited carbon from the tar and gas evolved in coking. "This deposited carbon gives the bright silvery glaze that distinguishes the Connellsville and other bee-hive oven cokes."

The vertical retort oven is described by Mr. Fulton as originating in the difficulty of coking the inferior dry coals of Continental Europe in the bee-hive oven. The Knab oven of 1856 is usually regarded as the initial or root type, from which all the rest of the family have been evolved. Generally, they consist of a series of vertical chambers about 30 feet long, 16 inches wide, and 5½ feet high, with side and bottom flues to supply the necessary heat for carbonization. This heat is derived from the combustion of the evolved gas, first deprived of its condensable constituents. These coke-ovens accomplish a threefold service. By their continuous heat, they utilize the small volume of fusing matter in the "dry" coals; they yield a larger percentage of coke than the bee-hive; they lend themselves to the substitution of mechanical for hand labour. Supplementary to these recommendations, as coke-producers they save the residual products of carbonization. A test of Semet-Solvay coking plant, established at Syracuse, New York, has been made with the substantial sample of 2058½ tons of Connellsville coal, presumably of the same general character as already described. This test showed an average yield of 71·035 per cent. of coke. As the theoretic coke yield was only 67·88 per cent., the result showed a large gain in deposited carbon, with 20-hour charges. Mr. Fulton goes on to describe the Otto-Hoffmann carbonizing and residuals recovery plant, its offshoot the Festner-Hoffmann, and others, which differ from one another more in structural details than in organic plan. Mr. Fulton classifies them all as giving approximately the same percentage yield of coke, although some economical differences in other respects are shown among them.

The author admits that the large cost of the plant, and the necessity for continuous work, are against the general introduction of the vertical retort-ovens. They have the advantage, however, besides those already cited, of enabling the two extremes of coking coals—the very rich and very poor in bituminous matter—to be dealt with more satisfactorily than can be done by the aid of the bee-hive oven. Mr. Fulton discusses mostly the production of metallurgical coke; but he also remarks that coke fuel in the past few years has found an increasing market in domestic uses. "This has been developed by a special preparation of the coke, breaking it to several sizes for use in heating furnaces and stoves; thus enabling it to take the place of anthracite coal, compared with which it gives greater economy and equal efficiency. The outlook for the expansion of the manufacture of coke is, therefore, assured." This conclusion is remarkable, and calls for some comment.

With regard to the future of metallurgical coke, not only in the United States, but also in Great Britain and on the Continent of Europe, there is not much to be said that has not already

been adduced verbally and in print many times. The burning of coking coal in the raw state, for any purpose which could be equally well served by the coke producible from it, is a barbarism which will disappear in time. Low priced as are the liquid residuals of coal carbonization, including the ammoniacal liquor, it does not pay to throw them away. The burning of raw coal for steam raising is fast being reduced to the use of the cheapest and the most valuable grades of coal—the former for local use, and the latter for distant consumption. The coke produced by the bee-hive oven is still, and will remain for some time longer, the standard of quality for all fuel of the kind in the regions where it has been brought to the highest degree of perfection; but the pressure of economic considerations is certain to be brought to bear upon this product with increasing strength as time goes on. The peculiar, and, for us, debateable point in Mr. Fulton's paper, lies in his reference to the alleged use of metallurgical coke in the United States for domestic purposes. This is so different from all English experience that, assuming the statement to be true, it calls for some further explanation. It is not to be overlooked that Mr. Fulton speaks of broken metallurgical coke as finding a market for domestic purposes, to the displacement of anthracite coal. Now this class of coal is only used in this country for domestic purposes in the Welsh neighbourhoods where it is raised. All the attempts that have been made from time to time, under the auspices of smoke abatement enthusiasts and others, to create a domestic market for this fuel in England have failed. At the present time, there is not a single London coal merchant advertising anthracite for sale, even for greenhouse stoves; whereas a few years ago several of these traders strove to make a speciality out of this particular line of fuel, on account of its smokelessness. In Wales, where it is still used for all purposes, it is the natural local fuel; and there is certainly no coke supply to displace it. According to Mr. Fulton, things are different in at least some parts of the United States; consumers having a perfect economical choice between metallurgical coke, and anthracite. But this, after all, can only be for consumption in close stoves.

What we are most curious to learn in this connection, however, is: Where is the gas coke? English people do not burn metallurgical coke for household purposes, even in stoves; but they do everywhere, and in large quantity, burn gas coke in this way. Is Mr. Fulton's observation to be taken as a side light upon the extension of the carburetted water-gas manufacture in certain parts of America—notably Pennsylvania and the surrounding regions—whereby the production of gas coke has practically ceased in these parts? If so, the disclosure supplies food for reflection.

Upon general grounds, Mr. Fulton's statement in this respect is not unwelcome. The age of the employment of bituminous fuel in its raw state is, according to this evidence, drawing to a close in the United States. Here in England, the age of coal will last some time longer. So far as London is concerned, the use of raw, smoky coal for all domestic and many manufacturing purposes, has actually received reinforcement by the remission of local dues which have facilitated the introduction of coals of a cheap, dirty class, which formerly did not come so far south. On the other hand, gas coke was never so cheap as it is at present over the whole of England; and indications are not lacking that, in spite of all drawbacks, this fuel is steadily growing in the public favour. There is not, at any rate, any immediate prospect of metallurgical coke finding a market for household requirements in this country, even if the suggested turning of the tables by gas manufacturers upon their coal-carbonizing rivals by the production of metallurgical and locomotive coke in some gas-works is slow of realization.

In truth, it takes long to turn the course of an established industry, notwithstanding the existence of economical reasoning in favour of such change, especially when the industry is one of those fundamental operations that underlie, as Mr. Fulton remarks, a mass of technical development. If it could be established experimentally to-morrow that it would be to the advantage of all gas-works to alter the character of their coke production, no man now living would see the complete disappearance of gas coke from the market. This inertia of old-established industries is a fact, by the way, for which few inventors and advocates of novel processes make sufficient allowance.

North of Ireland Association of Gas Managers.—The annual meeting of this Association is to be held at Holywood next Tuesday, under the presidency of Mr. T. Frizelle, the Manager of the Holywood Gas-Works. According to the programme issued by the Hon. Secretary (Mr. J. Whimster, of Armagh), in addition to the President's address there will be two papers—"Notes on New Gas-Burners," by Mr. A. Gibb, of Newry, and "Difficulties I have Met With, and how they have been Overcome," by Mr. W. Miller, of Cookstown—a conversation on "Loss by Leakage, or Unaccounted-for Gas," to be opened by Mr. P. J. Salmon, of Galway; and a lecture (illustrated by experiments) on "The Chemistry of Ammoniacal Liquor," by Professor W. Ivison Macadam, F.R.S.E., &c., of Edinburgh. By the courtesy of the Directors of the Gas Company, luncheon will be provided for the members. It has been customary to have an excursion the day after the meeting; but no arrangements have been made for one on this occasion.

NOTES.

Pipe Inspection in Japan.

It may be within the recollection of our readers that not long ago a scandal was caused in Tokio by the discovery of certain irregularities in connection with the contracts for supplying the pipes for the water service of the city; and several Government officials were involved. Pipes were passed which were afterwards found to be defective, and had to be taken up. This has led to the contracts being placed with foreign firms, and to the institution of a system of inspection which is strict to the verge of absurdity. "Engineering" recently gave a few particulars from the "Japan Weekly Mail" which, we think, bear out the latter statement. If the pipes formed part of an elaborate astronomical apparatus, greater exactitude could not be required. The limit of error allowed is so small that a pipe of 42-inch bore is rejected if it varies from the prescribed measurement by 1-16th of an inch. The pipes are hammered, gouged, and pricked to ascertain whether or not some minute flaw or hole has been developed in the casting; and the discovery of a hole neither deeper nor larger than a match head suffices to ensure the condemnation of a pipe. If, however, they pass the preliminary examination, they are subjected to hydraulic pressure, and beaten violently with heavy hammers under this pressure. Two pipes, one of which stood 300 lbs. pressure, were rejected on account of flaws invisible even with a magnifying glass; the fact that both were carefully tested and inspected before being shipped counting for nothing with the inspecting Japanese official. It is said that acres of ground are covered with so-called defective pipes. This is evidently a case in which a great deal more zeal is exercised than discretion.

Effect of Sulphate of Ammonia on Grass-Growth.

In the course of a series of lectures on botany for teachers in connection with technical education in Norfolk, Mr. T. B. Wood, M.A., furnished some interesting information as to the effects of sulphate of ammonia, nitrate, and other land dressings, on crops. He stated that at Rothamsted Park, a piece of land had been laid out as pasture for a very long time; and about fifty years ago, experiments were commenced with various kinds of manure. Every six years, parts of the plot were cut, and carefully examined by experts. Taking the plot dressed with nitrate of soda alone, they found: Grasses, 83·5 per cent.; leguminous plants, 1·8 per cent.; miscellaneous, 15 per cent. These figures showed an increase over the unmanured plot of 12·5 per cent., while the leguminosæ had almost disappeared; and the miscellaneous stuff had decreased 5·5 per cent. Sulphate of ammonia gave the following results: Grasses, 94 per cent.; leguminosæ, 2 per cent.; miscellaneous, 5·8 per cent. Comparing these with the previous figures, it will be seen how greatly the grasses augmented with this treatment, and how the pod-bearing plants had almost disappeared. The grass that developed most of all with a dressing of sulphate of ammonia was the *Festuca ovina*, better known as sheep's fescue, which increased to 53 per cent.; this enormous amount being due to the fact that sheep's fescue is a typical feeding grass, with a large number of rhizomes and stolons well suited for light land, and also that sulphate of ammonia is not very soluble, and its effects do not reach far down. To sum up, dressings of nitrogenous manures enable the grasses to crowd out other plants. Nitrate of soda benefits deep-rooted grasses; while sulphate of ammonia helps surface-rooted ones.

Another Function for the Ether.

Physicists in all countries are indefatigably working at the Röntgen rays, as to which Sir George Stokes has recently declared, in an address to the Victoria Institute, that there is mathematical reason to believe them to be transverse vibrations of the ether of extreme frequency. This declaration did not at first quite meet the views of Lord Kelvin, who stated that many of Sir George Stokes's reasons were very contentious. On the whole, however, Lord Kelvin was inclined to believe that Sir G. Stokes might be right. After all, it was only a matter of putting down a little more to the account of the ether, which may as well be supposed to vibrate a few billion times quicker under the Röntgen impulse, than it is assumed to do when transmitting light. The ether has so many irrational and mutually conflicting qualities attached to it by hypothesis, that another more or less cannot make much difference. The "Engineer," commenting upon this agreement of Stokes and Kelvin, remarks that "if we once concede even a few billion of vibrations per second as conceivable, any increase the mathematician thinks proper to ask for presents no difficulty; in point of fact, we get out of the region of true science into that of transcendental arithmetic. The numbers employed have no more meaning to the average intellect, and go no nearer to explaining the facts, than do theorems concerning a fourth dimension in space. In truth, we do not know what light is. We do know that, under certain conditions, many of its phenomena could be produced in the way explained by mathematicians; but there is no proof possible that similar results could not be obtained in a totally different way, and one which perhaps, after all, would not make such large demands on our faith." Meanwhile, it may be noted that M. Alfred M. Mayer thinks he has proved that the law of inverse squares applies to Röntgen radiations.

TECHNICAL RECORD.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Edinburgh.

In the "JOURNAL" last week, we reported the general business at the above meeting, held in Edinburgh, under the presidency of Mr. A. Yuill, of Alloa, on the 22nd ult., and published the paper contributed by Mr. W. Young, of Peebles. We now give an instalment of the other papers, with a report of the discussions thereon.

Mr. H. O'CONNOR (Edinburgh) read the following paper:—

SOME LABOUR-SAVING METHODS IN PHOTOMETRICAL TESTING.

To simplify the work of the gas manager, and to reduce the amount of it where possible, has long been my desire; and I have from time to time made use of the diagram form of exhibiting tables for this purpose. At the same time, I have always had the wish to be able, in some measure, to assist my professional brethren by substituting for these, where possible, some mechanical means. For some time past, I have been considering the possibility of making a photometer which, if not sufficiently minute in its results for Gas Companies under the London Referees, might yet serve the requirements of the vast body of engineers throughout the country, who desire something which shall be more accurate than the jet photometer, while not requiring the very careful adjustment and delicacy that is necessary with the elaborate bunsen photometer. It was this proposed photometer which I had hoped to have been able to place before the members at this meeting of the Association. However, in the space of time at my command, I have been unable to complete the necessary experiments; and I have therefore to content myself with reading a few notes upon the points which, during the course of my experiments, have arisen, and which I hope may prove of interest.

While engaged in trying to find this simpler form of photometer, I was confronted at an early stage with the question of the expansion and contraction of the gas which is required to be measured, which, necessitating calculation, &c., prevented, at the time, the arrangement in the simplified manner desired. At this stage of the experiment, it is not possible to give in detail the method of testing which I hope, at no very distant date, to be able to lay before the gas engineering profession. But I propose to submit to this meeting one or two points which have for a time blocked the way; and to indicate the methods which I have adopted to clear the road in some slight degree.

As before mentioned, the variation in the result of a photometrical test is, as you are all aware, considerably influenced by the temperature and barometrical pressure of the air at the time of the experiment; and we are all familiar with the table prepared by the Metropolitan Gas Referees for the correction of the results of any tests to the standard temperature and pressure. This, however, necessitates calculations and a certain knowledge of decimal arithmetic, which a large number of men, who are perhaps foremen and workers in small gas-works, have not had the opportunity of making themselves acquainted with. Therefore it appears to me that any arrangement for simplifying the calculations might prove of assistance to some of those workers, and would possibly save time to others who, while having the necessary knowledge, lack the necessary time to make the calculations; that is to say, they can employ their time more profitably in other ways if they can get a means of shortening the work of testing the gas. Such a method I believe I have devised; and it is shown upon the walls by Diagrams I. and II. Diagram I. is merely a graphic diagram of the Referees' table calculated from the formula—

$$N = \frac{17{\cdot}64\,(h-a)}{460 + t}$$

Where N = Tabular number.
" h = Height in inches of barometer.
" a = Tension of aqueous vapour at $t°$.
" t = Temperature in degrees Fahr.

Although I have not come across it, a somewhat similar diagram may possibly have been used by other engineers.

Diagram II. [next page] I believe to be absolutely new. It is a graphic method of obtaining the results of a calculation, by which anyone, once he has mastered the arrangement of the different scales, can ascertain at a glance the variation in the quality of the gas due to the difference in temperature and pressure from the standard 60° and 30 inches. Along the bottom of Diagram II. will be found a series of figures which represent the different "Tabular numbers," and opposite 1000 will be found a vertical column of figures. These represent the quality of the gas. Therefore all the vertical lines or ordinates represent the tabular numbers; and the curved lines the candle power of the gas. To use this diagram, all that the observer has to do is to make his tests by the photometer, and, having obtained the average, to note the tabular number by Diagram I. for the temperature and pressure of the testing-room, and to use that figure on Diagram II. Proceed up the line immediately above the figures until it cuts the sloping line corresponding to the candle power found by the photometer. Proceed horizontally, and note the figure above the 1000; and this will be the actual candle power of the gas at 60° temperature and 30-inch barometrical pressure. A similar table is also shown on Diagram III. for the variation in the rate of burning of the candles, in which the bottom line shows the number of grains burned by the two candles in ten minutes, and at the top the time taken to burn the 40 grains; so that either method of noting the rate of burning may be used. The centre vertical line shows the candle power of the gas; and in the same way the candle power is noted immediately above the number of grains. Then at the point where the horizontal line from this candle power cuts the centre line will be found the candle power of the gas at 60° and 30 inches.

A further table, Diagram IV. [p. 215], enables anyone to find the corrections for the variations in volume of the gas consumed, the method of using which will be easily understood after the explanation of the other diagrams. These last three diagrams might have been combined, but would possibly have confused some of those for whom they are more especially designed.

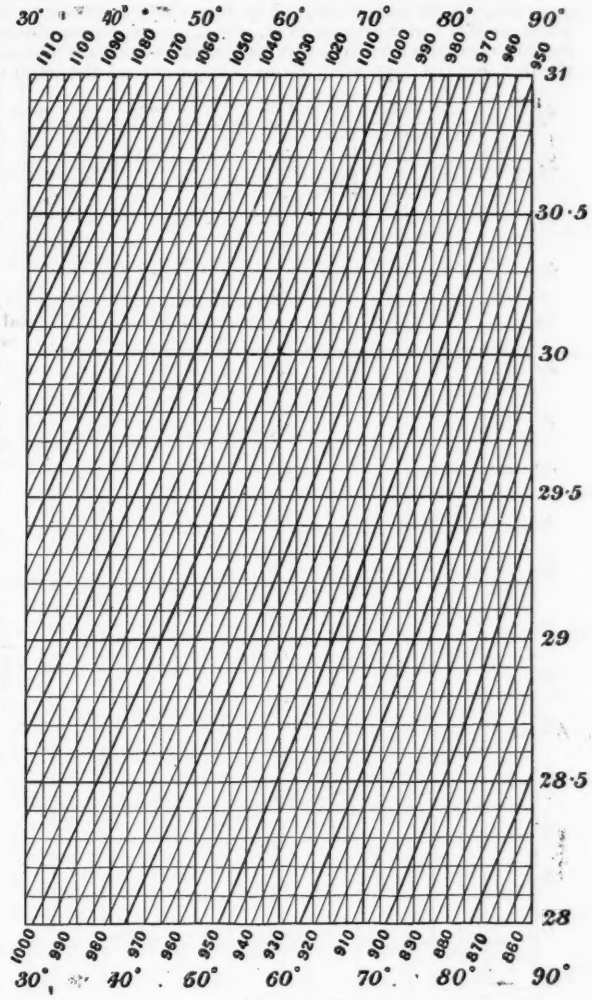
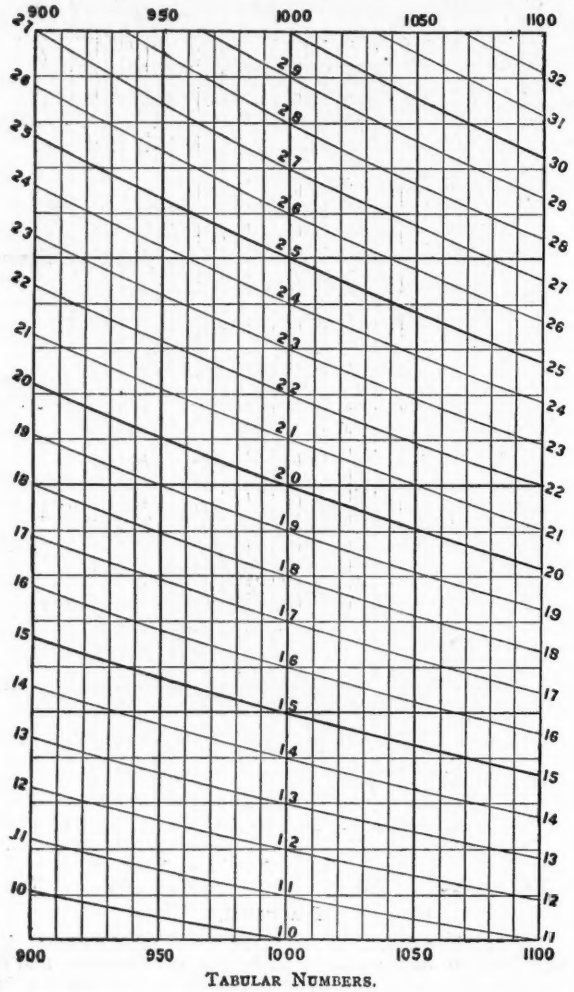


DIAGRAM I.

Let us take a case to illustrate the use of the diagrams. We will imagine that we have made our ten readings, and the average is 25·6 candles when multiplied by two for the two candles. The barometer is at 30·4 and the thermometer is at 72°. The tabular number is then found by Diagram I. to be 982. Then, by reference to Diagram II., we find that the point where the 25·6 sloping line cuts the 982 vertical line is level with, say, the 26·1 line at the vertical line above the 1000. Next, our candles burned 41 grains in the ten minutes; and Diagram III. shows that where the 26·1 line cuts the 41 grain line, it is level with, say, 26·8. The gas, however, had burned at the rate of 5·1 cubic feet per hour; therefore the net illuminating power is only, by Diagram IV., say, 26·3 candles. It will be seen that not a single calculation has been made, and only such an observation as any man who is intelligent enough to make a photometrical test can master in a few seconds.

Having gone to this extent, I began to consider if it was not possible to still further simplify the making of photometrical tests, and was eventually struck with the fact that Diagrams I. and II. were in reality superfluous; for it would be easy to arrange a test-meter in such a way as to pass the correct quantity for the temperature and pressure, which would be equivalent to the proper quantity of 5 cubic feet per hour at 60° and 30 inches, and so save any calculation on that account.

A clever method has recently been devised for correcting meters for the rise and fall of the temperature of the air; and although it has been shown that by this method it may be done to some extent automatically, the author ventures to think that the arrangement will hardly prove sufficiently accurate for the purpose of correcting test-meters, nor has the means been suggested in that patent for working small wet meters to any degree of nicety. I have therefore obtained provisional protection for a very simple addition to the ordinary wet meters by which the variation in the water-line may be accurately and rapidly gauged according to the temperature and pressure. The first arrangement which I tried consisted of a single plunger and tank, with the scale worked according to the tabular number; and this correctly answered all the problems then before me. But there appeared still to be something wanting to make the apparatus quite complete, and to further simplify the testing process; and to do this I placed two plungers and two tanks—one to rectify for the temperature and one for the barometric pressure. So that Diagram I. on the Referees' table is no longer needed; each plunger working by itself to correct according to its own scale. Only one thing requires to be noted in this latter arrangement, which for some time seemed likely to upset this system of varying the water-line, and that was the fact that the depressing of one plunger caused the water to



Tabular Numbers.

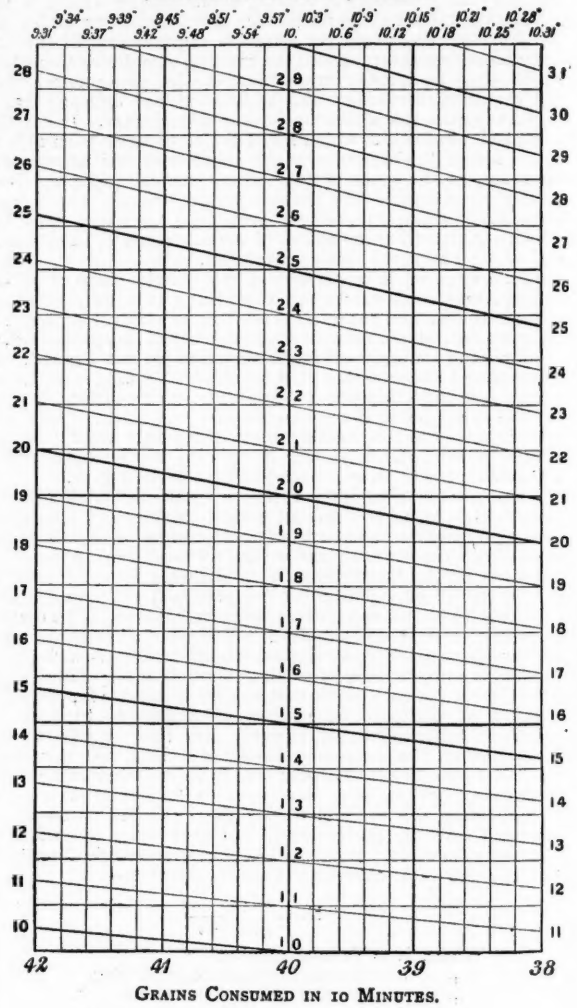
Diagram II.

rise in the tank around the other plunger; and this appeared at first to be likely to cause an error. This difficulty was, however, overcome by making the plunger sides quite parallel, when the rise of water, being over an equal area at all heights, removed all possibility of error.

With regard to the proportioning of the plungers and the subsequent marking of the scale, these have been worked out so that the tension of the aqueous vapour is taken into account. The law that the higher the temperature the greater is the amount of aqueous vapour held in suspension in the gas, has enabled me to so divide the scale as to allow for this. This arrangement can be seen upon the table, adapted to a test-meter for photometrical purposes, which will show more readily than a long description the simplicity of the plan proposed.

As will be noticed, there are two small tanks connected to the inside of the meter case, with one plunger inside each, which can be easily raised or lowered as required. When the plunger is immersed in water, it raises the level of the water all round—that is to say, it not only affects the water in the tank, but also that in the meter. The cubic contents of that portion of the plunger which is under water and the area of the water surface in the meter and the tanks govern the extent to which the travel of the plunger can make the meter fast or slow. In the meter before you, it has been deemed best to use two plungers—one to correct according to the barometer and the other for temperature, as there is less likelihood of error; but it is quite possible to make the larger one answer both purposes, providing a second movable scale, so that the plunger can be first set for temperature, and, secondly, for barometric pressure. But for simplicity, the two plungers are perhaps better. The scales upon each of these plungers are divided to represent the variations from 28 inches to 32 inches pressure and from 40° to 90° Fahr. temperature. As the gas in the photometer-room should be lighted fifteen minutes before the test is made, and the candles at least ten minutes before, it is not considered necessary to provide for such an extreme of temperature as less than 40° Fahr. When it is desired to use the apparatus, all that has to be done is to first set the two plungers at 60° and 30 inches, and adjust the water-line in the usual way by the mark upon the water-box of the meter; then screw up or down the two plungers until the pointers are opposite the temperature and

Time Taken to Burn 40 Grains.



Grains Consumed in 10 Minutes.

Diagram III.

pressure of the moment. If the gas be now passed through the meter, the amount of gas registered will not be the amount which has actually passed through the meter but the representative quantity at 60° and 30 inches; thus saving any calculation by the tabular number.

When first experimenting, I fitted a plunger to an ordinary test-meter of 0·083 capacity for one revolution of the drum, but found that when the usual patent drum shown in Fig. V. was in use, the practical limit within which the meter would work satisfactorily was 3 per cent. each way, fast and slow, which, while possibly insufficient for all purposes, would yet have permitted the corrections to be made in nearly all cases, ranging, as it does, from a tabular number of 970 to 1030. This will be seen, on reference to Diagram I., to include a considerable range of temperature and pressure. It was, however, thought desirable to make the apparatus so that it would correct up to 10 per cent. each way, or from 900 to 1100 tabular number; and this was first tried by using a drum of larger capacity—0·125—and raising the net water-line until the

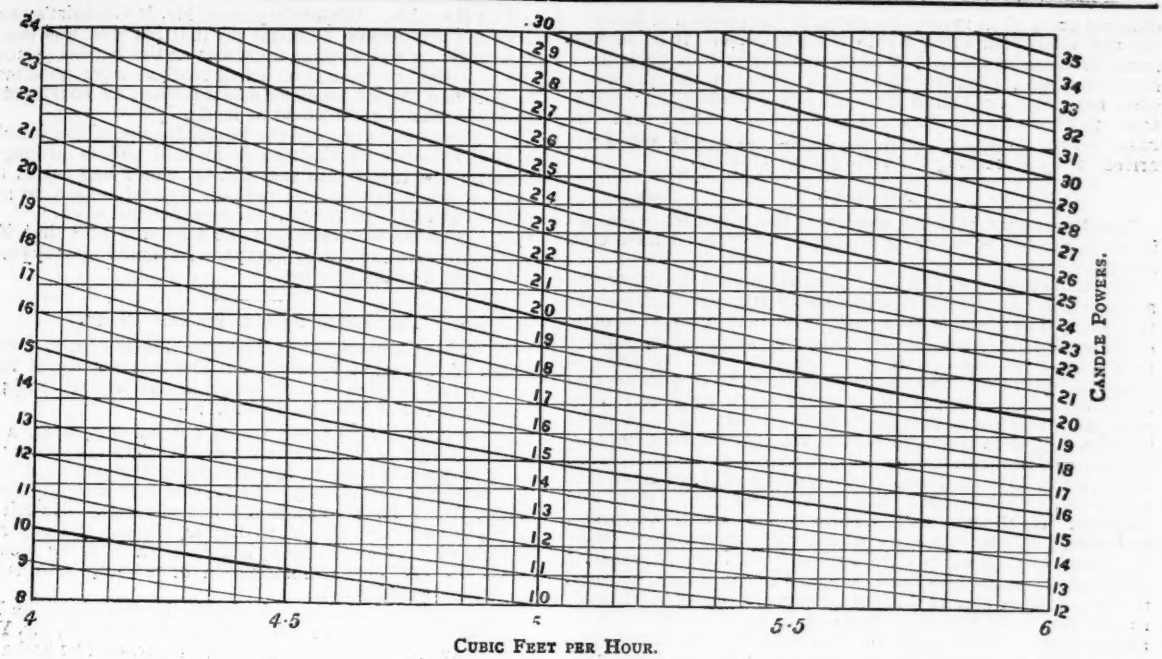
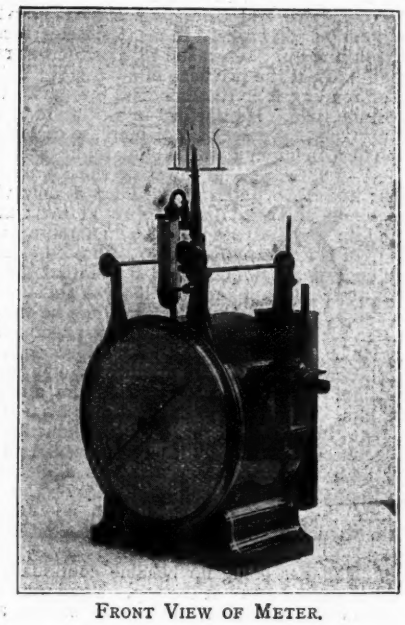
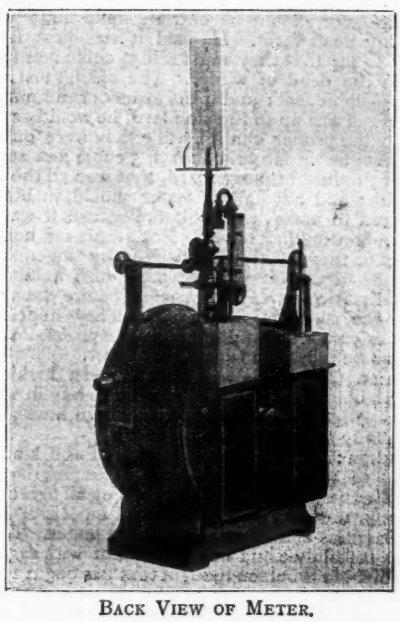


Diagram IV.



Front View of Meter.



Back View of Meter.

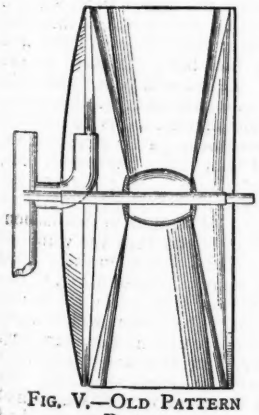


Fig. V.—Old Pattern Drum.

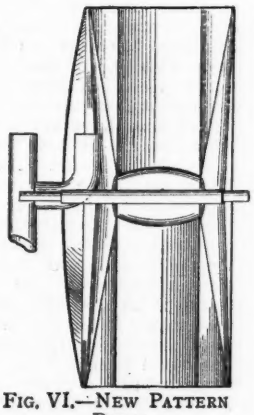


Fig. VI.—New Pattern Drum.

meter was only of the capacity of the previous one (0·083). But it was found that the depth of the partition below the water when at the high-water line caused the meter to work stiffly and somewhat unevenly, owing to the considerable difference of level necessary to accomplish the desired object. Remembering that the aim of designers of wet meters is to get the least possible difference in registration for the greatest possible variation in water-level, the next thing to be done was to so design the drum that the reverse, if necessary, was obtainable. Structural difficulties, however, prevented the full realization of this object, and a drum, as shown on Fig. VI., was then finally decided upon; and this is the form of drum which is in use in the meter before you, which will work 10 per cent. fast without any stiffness, and at only 1½-10ths pressure, while the light is, as you will see, very steady. Besides the saving in time that this apparatus will effect, there is also to be taken into consideration the greater accuracy likely to accrue from the use of a mechanical arrangement in place of a mental calculation.

A further use to which the arrangement can be put with advantage is to employ the meter for the purpose of the durability test, having, of course, previously set the two plungers according to the state of the atmosphere. By this means, the test mentioned is rendered considerably more exact, and this without complicating it unduly, so that any workman can be quickly taught to use the meter for the purpose of obtaining the illuminating power, and, without the use of figures, obtain a corrected result.

While upon this subject, it might be well to point out that, when employing a meter for this test, it is as well to use such a quantity of gas as is passed by one revolution of the drum. In the meter under notice, this will equal 1-12th cubic foot. The reason for this is the well-known fact that a meter drum does not pass the gas in and out of the partitions at the same rate at

different parts of its revolution, owing to the position of the outlets and inlets with reference to the water-line. It is on this account, therefore, that it is suggested that 1-12th cubic foot should be used for the test with such a meter, so that the complete revolution only shall be taken into consideration; and a table is appended showing the comparative results with the usual 1-10th cubic foot method, or the same end would be arrived at by shortening the flame proportionately.

Discussion.

The PRESIDENT said he was sure the members were all indebted to Mr. O'Connor for his paper, which must have cost him great labour.

Mr. A. MACPHERSON (Kirkcaldy) remarked that the paper was a thoroughly practical one, and appealed to the members in that way. There was not the least doubt that, if Mr. O'Connor could accomplish what he was aiming at, it would be a great saving to them, because it would enable them to make a practical test of gas in a short time. It would be of considerable advantage to them in enabling them to see at a glance if they were producing gas of the quality they wanted. In this way, he thought, they were much indebted to Mr. O'Connor for what he had done in trying to produce a meter such as he had placed before them. He must say, however, that he did not agree with the law which necessitated the correction for temperature and pressure. He thought such a correction was only necessary, and should only be necessary, where they wanted to compare two gases, and not where they wanted to find the illuminating power of the gas that was being supplied to consumers, because, if the gas were altered in bulk, they were selling to the consumers that bulk; therefore they had no right to substitute an assumed bulk. They ought to get credit for the illuminating power of the 5 cubic feet of gas supplied to the consumer as it was used by him. He therefore considered that, except for purposes of comparison, the correction for temperature and barometric pressure should be entirely done away with. He did not see any need for it. He said it was most unjust to a gas company to say that they must sell 5½ cubic feet for 5 cubic feet of gas in the dead of winter. The official test would be corrected to 5½ cubic feet; and if the examiner did not find that the expanded gas was up to the standard, he would say that the gas was below the proper quality, while they were only getting paid for 5 cubic feet. He said that if 5 cubic feet supplied to the consumer produced the standard, that was all the examiner had to do with; and any official tester should, in his opinion, not be required to make a correction, because it was unjust—the consumers getting half a cubic foot of gas for nothing. At the same time, they must all admire the ingenuity which Mr. O'Connor had displayed in devising such a labour-saving appliance as that which he had brought before them; they all wished him the success he deserved. They hoped that the whole of the advantage would not be to the profession, but that Mr. O'Connor would get considerable benefit.

Mr. A. BELL (Dalkeith) said he had been looking at Mr. O'Connor's elaborate tables; and he saw the way in which they were got up. Might he ask if the meter was in the experimental stage, or actually in the market.

Mr. O'CONNOR: This is the first meter of the kind that has been made.

Mr. J. M'GILCHRIST (Dumbarton) said they all agreed with Mr. MacPherson in the eulogy he had passed on Mr. O'Connor for his clever diagrams and his wonderful new meter. But he (Mr. M'Gilchrist) certainly could not follow him with regard to his standard. Mr. MacPherson thought that gas ought to be tested at any state of the barometer or any temperature of the gas. Now, they must have a standard—they could not get along without one; and he was glad that Mr. O'Connor had been able to overcome their difficulties in such a simple way through his meter. He was also glad that Mr. O'Connor had not yet completed his experiments, because he hoped that, as he went along, he would be able to discover something more than he had yet done about photometry. They were in a labour-saving age; and they trusted Mr. O'Connor would yet be able to devise a photometer which would give them the illuminating power without their having to test the gas at all.

The PRESIDENT observed that he was like Mr. M'Gilchrist—he did not see very well how they could do without a standard.

Mr. MACPHERSON said they entirely misconceived what he had said. He would retain the standard for comparative purposes. He did not advocate at all the doing away with the standard.

The PRESIDENT said he understood Mr. MacPherson to say that, if they were going to compare one gas with another, they must retain the standard; but that in testing gas supplied to the consumers, they should not be obliged to reduce it to the standard, because the people were getting the illuminating power as it was shown.

Mr. MACPHERSON: Quite so. Test it as it is being supplied.

Mr. O'CONNOR said he agreed with Mr. MacPherson that a consumer receiving a certain quantity of gas had to burn it at the absolute quality at which he received it, and that it should be measured as between the consumer and the supplier; but that, when it was a question of comparison between one works and another, or between one gas and another, they must go back to the standard. But the law said the gas must be tested with the correction; and it must be so. They must go back to the table. With reference to Mr. M'Gilchrist's remark about the photometer, he might say that his idea was that the photometer he was working upon was on the bunsen principle; and he wished to make it as easily read as a jet photometer. Until he had carried his experiments farther, he could not say exactly in what form it would be made.

The PRESIDENT proposed the hearty thanks of the members to Mr. O'Connor for the trouble he had had in placing the subject before them. He said Mr. O'Connor had raised their hopes to some extent; and perhaps by next season he might still further enlighten them as to photometrical work.

Mr. O'CONNOR acknowledged the vote, and said that, if his photometer were extant by next year, he should be very pleased to describe it to the meeting.

DISCUSSION ON MR. YOUNG'S PAPER.

Mr. A. MACPHERSON (Kirkcaldy) then read the paper prepared by Mr. W. Young, of Peebles, on "The Permanency of Illuminating Gas," as given in the "JOURNAL" last week (p. 166); and it gave rise to the following remarks:—

The PRESIDENT said, Mr. Young not being present, a note would be kept of any discussion which might take place; and Mr. Young would have an opportunity of replying to it in the Proceedings of the meeting. He was sure they were all indebted to Mr. Young for his excellent communication. He felt that the matter was very difficult to discuss, because the paper was teeming with scientific terms; but should any of the members desire to get further information or advice, he was sure Mr. Young would give it.

Mr. A. BELL (Dalkeith), referring to the remarks of the President that, if there were any criticism of the paper, Mr. Young would have an opportunity of answering it, said he had a difficulty on that point in this respect—that he always found that where Mr. Young reaped there was not much for the gleaner. But his retrospective and chronological sort of review of what had been done before, brought to his (Mr. Bell's) memory things which stirred him up. When the 1874 paper was read, he was abroad, and had not the privilege of hearing it; but he had the pleasure of reading it in the technical journals. It came at a very opportune time. He was just in a position to require the help of that paper. On account of increase of make, his plant was too small. Being in a warm climate, he was troubled by the tar getting forward and lowering the illuminating power of the gas; and that paper opened up a new view to him. He came home, and saw the analyzer at work at Hamilton. He adopted it; and he presumed he had more experience in the working of it than anybody else. He used it for two years, with very curious results. It was found that the gas was not permanent at a low temperature. He was not surprised at that in Hamilton. In the warm climate where he was, and where there was no such thing as frost, the gas was much more permanent. He was working with Lancashire coal, which with 10 per cent. of cannel produced about 17-candle gas at the point of combustion. As soon as he started the analyzer, he got 20-candle gas. The tar was taken direct from the hydraulic main to the analyzer, through non-conducting materials, so as to conserve the heat. It was conveyed to the bottom of a very high tower, inside which was a steam coil, which kept the temperature at about 212° Fahr. The tar, coming direct from the hydraulic main, had no time to absorb any of the hydrocarbons. It was kept continually at 212° Fahr.; and it overflowed, and ran away in a pitchy condition. The gas going up became continually lighter and lighter till it passed away at the top. They were then lifting a section of mains annually. The year before adopting the analyzer, they had any quantity of naphtha in the mains. The year they started it, when they opened the mains, there was not a single scale to be found. He was so astonished at this, that he offered the workmen 6d. per scale; but they could not find any. This proved that the whole had been dissolved in the mains, just as Mr. Young had said. They could pass those rich, permanent gases through naphthalene scales in crystalline form, for gas must have some condensable matter, so as to dissolve the scales. In his case, the gas having been partly condensable, removed the scales. Another curious thing happened. Mr. Young said there was a disadvantage in taking the tar too rapidly from the gas. In the analyzer, the tars were never in contact with the gas below 212° Fahr. It went on in this fashion for about eighteen months, until they found that the whole of the upper portion of the analyzer had become entirely filled with naphthalene. He was never more astonished in his life. It might be that they were going too fast, and that it was necessary that the gas should be longer in contact with the tar. Mr. Cusiter's experiments were most suggestive and encouraging. They had benefited two industries. In the first place, they suggested to Mr. Young the recovery of oil from shale, &c. As the result, millions of gallons had been recovered, which had been partly used for the enrichment of gas; so that it had served both parties. When they were recovering the light spirit, a gas of very high illuminating power was given off at the spirit end. When condensed, its boiling-point was so very low that Mr. Young thought there would be a good market for it as a refrigerator for the making of thermometers and the like. Plant was erected to try to condense it; but they could not do it. A pump was put up, which they used to work at 40 lbs. pressure.

The temperature was lower than that of salt and snow; but it was such a dangerous operation that it was stopped. He thought they had to thank Mr. Young for all these experiments. As an Association, they were deeply indebted to him, because he went to the root principle of all the subjects he took up, and gave them a great deal of information.

Mr. MacPherson said it was scarcely for him, the reader of the paper, to criticize it; but he would have very great pleasure in simply saying that he was sure the younger members of the Association would derive very great benefit if they would try to get the back papers to which Mr. Young had referred. They would find them very instructive and edifying. There was a great deal to be said on the condensation of gas; and it would be a very good education to the younger members if they would study the papers Mr. Young had read to the Association. This retrospect might also serve to enlighten some of their friends who seemed to think that Scotland was a laggard in the march of progress. He thought those papers would show that their northern Association had been pioneers in observing and discussing those subjects which were only now occupying the attention of their brethren in the South—that twenty years ago they had discussed and illustrated those principles; and they were now termed laggards, while those in the South were being held up to them as an example. He would only say, with regard to Mr. Young's paper, that it was really a most instructive one, and would repay careful study on the part of the whole of the members. The true principle, he believed, was announced in the paper as to how to make permanent gas, and how to make a gas which would not merely pass the testing-station, but give the full quality at the consumers' burners, which, of course, always meant with the use of proper burners to consume it. It was also of importance, in conducting the different processes of enrichment, to see that it was a permanent gas that was being produced, that it was really a chemical combination—a diffusion of the hydrocarbons or light constituents of the gas—and not a mere suspension of hydrocarbon vapours which on the slightest disturbance or reduction of temperature would deposit, and leave the gas as poor as before. He desired to join in thanking Mr. Young for his paper.

The President thought the members ought to put on record their appreciation of the efforts Mr. Young had made on their behalf. Personally, he must acknowledge that he had benefited greatly by the paper. After they had had time to read it, they might profit by it. They had the practical application of the scientific theories which were referred to in the paper; and when both were put together, he had no doubt they would be a benefit to them. He asked them to give a hearty vote of thanks to Mr. Young.

The request was cordially complied with.

Mr. Waddell's Paper.

Mr. Forbes Waddell (Forfar) then read a paper on "Forfar Retort-House Plant." This, with a report of the discussion thereon, we shall give next week.

Mr. J. M'Gilchrist (Dumbarton) followed with a paper entitled—

NOTES ON LONDON GAS SUPPLY.

The author began by stating that, on the Saturday following the last meeting of The Gas Institute, he called on Mr. G. F. L. Foulger, the Chief Distributing Engineer of The Gaslight and Coke Company, at his offices in the Goswell Road, and, in the course of conversation with him, obtained some particulars as to the Company's operations which he thought it would be of interest to lay before the members. He then proceeded as follows:—

The capital raised by the Company is upwards of £12,000,000. The market value of this stock at this moment is something over £30,000,000. Would Murdoch have ever dreamt of such a company? From maps, plans, &c., in Mr. Foulger's office, we learned that the Company supply gas to an area of something like 70 square miles. This, if put into acres, would make a good farm, even in America.

The Company have eleven manufacturing stations and nine distributing stations. There are a large number of testing-stations, and 23 valve-houses, having 4000 valves. They have also some nine district offices and show-rooms. It was also explained that two of the works—Beckton and Bromley—supply practically one-half of the gas required, and that they are what are known as high-pressure works—gas being sent out at times from them under no less a pressure than 300-10ths. Many of the up-town stations have districts assigned to them which require more gas than the station's manufacturing capacity. They have, therefore, to rely upon the balance being sent to them by means of the high-pressure system of mains which practically interlaces the whole of the Company's 27 districts. In addition to this, each up-town station has to take in a supply of gas into separate holders allocated for the purpose, to supply their proportion of the districts assigned to Beckton. Further, each up-town station has to take in a supply of gas from the high-pressure system sufficient to enable them (by means of their reversing pumps) to pump gas back into the high-pressure mains during the hours of heavy draught, to cushion up the pressure which is needed to supply the various district valve-houses with the necessary initial pressure. The pumping-mains act in the double capacity of gasholder supply mains and district valve-house supply-mains. All the works, stations, &c., are connected with Goswell Road; and everything there is so arranged that the chief has only, as it were, to pull the string and the figure moves.

The extreme distance that the gas manufactured at Beckton has to travel in a direct line is 17 miles; and experiment has proved that, if no other station were pumping into these mains during the time the heavy draught is on, 300-10ths pressure at Beckton would be reduced by consumption and friction to about 10-10ths at the extreme end—Fulham. There are also a number of districts which are known as transfer districts, and which, by means of valves *in situ*, can be supplied from different stations as may be desired, having regard to the stocks of gas available at the particular station. There are also a number of pressure stations all over the districts, situated at spots where pressures are known to be lowest; and the pressure register sheets are forwarded each day to Mr. Foulger's central office, Goswell Road, as a guide for the future working of such pressure.

As there are so many points at widely different levels within the 70 square miles of district, varying from 10 feet below Trinity high-water mark to 400 feet above it, a large number of districts are separately valved off to ensure an adequate supply being sent to each district from each separate station, and to ensure that each station shall send out the quantity of gas allocated to it in accordance with the previously agreed coal schedule. It seems that very particular attention has to be paid to the City of London proper, abounding, as it does, in vaults and cellars (some of them 75 feet below the pavement level), in addition to the numerous underground railway stations and signals, all of which are lighted with gas. Chess playing is simply not in it with this as regards concentration of mind. The hour of the heaviest consumption in the City of London is the dinner hour, between one and two o'clock. I always knew that the ordinary Englishman could consume a good dinner; but I had no idea he, at this hour, consumed so much gas. We now learned that the Company have some 2000 miles of main-pipes, ranging from 48 inches downwards—a length of main-pipes fully five times longer than the railway between Edinburgh and London. If we add the length of services, the Company's pipes, if joined together, would penetrate half way through the globe. It is estimated that they supply some 75,000 public lamps. Many of these are lighted by the Vestries and parishes (of which there are more than 200 in all) under the average meter system. The Company light and extinguish the remainder of the lamps at the rate of 1500 per minute. Many of us would be busy with the annual consumption of a couple of minutes of this work.

Without reckoning the enormous number of men employed by the Company's contractors, The Gaslight and Coke Company have over 10,000 employees—more than the working male population of some of our Scottish towns. The Company have about a quarter of a million consumers; and the number of cooking-stoves hired and sold is 114,000—indicating that fully one-half of the consumers cook by gas. From this we might infer that there is a great field for us in this direction. There are 87 gasholders, the total capacity of which is about 115 million cubic feet, or about 90 per cent. of a heavy day's output. Not ten gas undertakings in Scotland make this quantity in a year. The heaviest day's output of gas reached 128 million cubic feet; and, roughly, 12,000 tons of coal had to be carbonized to produce this unprecedented output. The gas made during the year 1895 was 20,661 million cubic feet. From the returns of our last Statistical Report, I find that the Company send out in one day more than double the maximum daily make of all Scottish gas-works, and manufacture in a year double the quantity of gas that is produced by all the gas undertakings in "Puir Auld Scotland."

Considering the enormous length of main and service pipes supplying the most important districts in London, where the traffic may be said to be continuous and heavy, the high-pressure mains, and the difficulties of controlling large bodies of men, it is a marvel to know that the loss by leakage is only a fraction over 5 per cent. This, to my mind, speaks volumes for the excellent system of management—a system which must have grown with the Company, but which appears at the present time to be as near perfection as mortals can make it.

I was very much struck with the large service-pipes which this great Company find necessary to fit into large places of amusement. Several of these have 12-inch services. We country people might think these service-pipes too large. But this Company, with the acme of management, find the size necessary; so we must accept their verdict. In Scotland, burghs—and Royal Burghs too—with a population of about 20,000 souls, have the same size of pipe for their outlet from the gas-works, and, moreover, supply the community well and at a low pressure. Why is this thus? Is it that the low illuminating power of the gas supply in London necessitates this enormous size of service-pipe? And is it the high illuminating power of Scottish gas that enables the burghs to be supplied with the same size of pipe? In any case, it is hard to make out how the lower illuminating gas has the higher illuminating effect. It is well that in London they have such men as Dibdin and Lewis T. Wright to protect the interests of gas consumers. These men have shown that it is light consumers require, not gas, and also the great loss the consumers

would sustain by a further reduction in the illuminating power, even although the price per thousand is lower. I think it a pity that all this elaborate distributing plant should be used to convey such a poor gas as is supplied to London, when at a very small cost the lighting power of the gas could be increased with the best result to all concerned. Our Mr. Young, of Peebles, has shown how this can be economically carried out.

My thanks are specially due to Mr. Foulger for his great kindness in supplying me with a map of London showing the various stations of the Company, and with the photographs now hanging round the room.

Discussion.

The PRESIDENT said they must all be conscious, from the nature of Mr. M'Gilchrist's communication, that it was removed from criticism, because it dealt with plain facts, which they could not criticize. All the same, they were very much indebted to Mr. M'Gilchrist. If anyone wished to make a few observations upon it, or required further information, he was sure Mr. M'Gilchrist would be willing to give it.

Mr. R. MITCHELL (Edinburgh) said there was only one point to which he should like to draw the attention of Scotch gas managers, and that was the number of consumers which The Gaslight and Coke Company had in their area. About nine years ago, they in Edinburgh made an inquiry as to the consumption of gas per consumer, as compared with what it was in London. They found that in London the average per annum was 75,000 cubic feet; and that in Edinburgh, 16,000 cubic feet. This made a very great difference. Mr. M'Gilchrist gave them figures with reference to the mileage in London; but he supposed it would surprise them to learn that to the south of the boundary-line in Edinburgh he had 232 miles of mains. Having this for a 16,000 cubic feet consumption, a comparison between the two cities could not be made. There was no doubt that The Gaslight and Coke Company had been very successful from the beginning. The Company had been well managed. They had from time to time introduced the very best appliances which could be got for the manufacture and distribution of gas; and, moreover, they had plenty of space. The last time he was on their works, they had more than 700 acres of ground on which to make all that quantity of gas; whereas he had only about 4¼ acres—about one-tenth of what there was at Beckton.

Mr. J. HEPWORTH (Edinburgh) said he should like to express his thanks to Mr. M'Gilchrist for describing to them, in so interesting a way, the supply of gas in the City of London. He had seen some of the photographs which were hung about the room; and if the members of the Association who had not yet seen them would take the trouble to look at them, they would learn perhaps more than they ever had learnt of the importance of the profession to which they belonged, because these photographs would show them how much ability and resource was required for the distribution of gas in London. Mr. Mitchell was just now carrying out in Edinburgh a new extension of mains, which he (Mr. Hepworth) sometimes saw; and he was amazed to find with what facility and ease such an undertaking as that could be got through.

Mr. A. WILSON (Dawsholm) said he should just like to add a few words, having been connected in a small way with one of the works of The Gaslight and Coke Company. If one were acquainted with the work, and accustomed to it for a short time, the feeling of wonder passed away. He certainly thought a great deal more aptitude for meeting difficulties, and getting over them, was very often required in small works than in a large one. In large works, they had every convenience, and any amount of men and material at hand, which they had not in small ones; and he thought the gas managers in the latter works should not lose heart because big things were being done elsewhere. At the same time, he considered that Mr. M'Gilchrist was very right in bringing the figures before the meeting, as he had done in a very concise form.

Mr. M'GILCHRIST said he could only thank the members for the way in which they had received his paper. It was a little ambitious in the title, but "it had come off." He thought, when he met Mr. Foulger, that the figures he obtained were so interesting, that he could not help putting them down. He was like the little fellow described by Dickens, who was always asking for more; and the more he asked, the more Mr. Foulger seemed to be willing to give. The result was that he asked him if he would care about the members of the Association hearing of what he had told him. Mr. Foulger said he should be delighted; and it was really to Mr. Foulger that they were indebted.

The PRESIDENT said he should like the members to give Mr. M'Gilchrist a vote of thanks for the trouble he had taken. He might mention that, in the Committee, while arranging for the business of the meeting, they anticipated difficulty in getting papers; and when they approached Mr. M'Gilchrist, he at once agreed to fill up a gap. This, he thought, merited their hearty approval, and deserved their thanks.

MR. BALLANTYNE'S PAPER.

Mr. J. BALLANTYNE (Rothesay) read the last paper on the *agenda*, on "Back-Pressure." This will be given next week with Mr. Waddell's paper.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

We continue to-day our report of the proceedings at the first annual meeting of the above Association at Nottingham, by giving *in extenso* the first paper read and an abridgment of the second, with summaries of the discussions. They were: (1) "The Interpretation of the Results of Water Analysis," by Dr. FRANK CLOWES, F.I.C., Professor of Chemistry at the University College, Nottingham; and (2) "Stockport District Water-Works: Description of Borehole, &c., near Wilmslow," by Mr. T. MOLYNEUX, of Stockport.

Dr. CLOWES' paper was read in his absence by the Secretary (Mr. W. H. Brothers). It was as follows:—

THE INTERPRETATION OF THE RESULTS OF WATER ANALYSIS.

In judging the suitability of a source of water for drinking and industrial purposes, the engineer naturally looks into the matter with the view of pronouncing rather upon the quantity than upon the quality of water which that source can furnish, and of forming an idea as to the facility with which the water can be supplied to the various users. In this he is helped mainly by a knowledge of the geology of the district, and by subsequent experimental borings if the water is derived from below the surface; and by direct gauging of rainfall and flow if it is derived from surface streams. As regards the quality of the water, reference is usually made to the chemical analyst for an opinion. The analyst founds his opinion mainly upon the direct results of analysis; but this result is now often supplemented by an examination into the relative number of micro-organisms which can be developed from germs, already existent in the water, by the process of "cultivation."

Presuming that no poisonous metals, such as lead or copper, are originally present in the water supply, the ordinary points on which an opinion is founded are the following. For drinking purposes, it is of primary importance that the water should be free from any suspicion of being actually tainted, or potentially tainted, with excreta, and more especially with human excreta, in an unoxidized condition. The danger involved by such a taint consists in the fact that many diseases are undoubtedly mainly propagated by the excreta of people who are suffering from them.

There are several substances whose presence in undue proportion in water, without any other evident source, points to the presence of excrementitious matter. Among these the element nitrogen takes the first place; and its presence in the dissolved organic matter of the water in undue proportion, or its presence as ammonia, nitrite or nitrate—products of change of such organic matter—usually casts suspicion upon, or leads to condemnation of, the water. It may be mentioned that the direct estimation of the nitrogen in the organic matter is a lengthy and troublesome analytical process, and that the nitrogenous organic matter is more commonly measured as "albuminoid ammonia;" while the total organic matter is measured by the amount of oxygen which must be chemically imparted to it for its rapid oxidation.

Common salt, or sodium chloride, is also often taken as an indication of contamination of the water with urine, unless the presence of an abnormally high proportion of this salt can be accounted for in other ways. No judgment can be formed from this substance in water which may be mixed with sea water, or which is derived from soil or rock containing large quantities of salt. In the sandstone of Nottingham, salt is present; but it is furnished to the water in strikingly uniform proportion. In this case, therefore, it is possible to make allowance for the quantity of salt derived from the rock.

When water is to be used for most industrial purposes, its quality is usually to be judged rather from the nature and amount of the mineral substances present in it. Generally the "hardening salts" of lime and magnesia are the most objectionable; since their presence always causes waste of soap in washing and scouring processes, and also prevents the finer class of goods from being washed satisfactorily at all. These "hardening salts," however, also lead to formation of "scale" in steam-boilers; and thus cause inconvenience and unnecessary expenditure in the generation of steam. A special impurity, which is objectionable when the water is to be applied for dyeing purposes, is iron. The presence of iron leads to interference with the production of many colours on fabric by ordinary dyeing processes.

In recent years it has become usual to examine water for the germs of various micro-organisms. These are too minute to be detected microscopically, but are found by microscopic examination after they have developed and multiplied in suitable culture media. In undertaking this special examination, the original idea was that certain micro-organisms which caused or accompanied specific diseases spread by water supply could be detected when present in the water. A step farther would thus be attained in the direction of detecting disease-causing property of the water; since, not the comparatively harmless constituents of the excreta are looked for, but the more specific dangerous organisms which are liable to be introduced by the excreta are actually dealt with. Identification of these "disease germs" has been successfully

carried out by experts in special cases; and results of the greatest value and importance have been obtained as to the actual disease contamination of water. But we have to await further development of this method of examination for its results to be of a general or universal character.

Incidental results of this line of research, however, of great importance to water engineers, have been obtained. It has been shown that these disease germs may be separated from water by subsidence or by filtration; and it has become possible to state the conditions under which this separation is most satisfactorily and rapidly completed. Indications have been further obtained that the removal of dissolved organic impurity from water by filtration is probably due to the action of certain special minute organisms, and that the efficiency of a filtering material depends not only, or even mainly, on the quality of the material itself, but also upon its suitability to act as a nidus for these useful micro-organisms.

These researches have accentuated the great importance of suitable subsidence and filtration for water which may have been possibly contaminated, and the suitable condition as well as character of filtering media.

Discussion.

The PRESIDENT (Mr. D. M. F. Gaskin), referring to the presence of iron in water, said he had proved, and he believed that Mr. Matthews, of Southampton, had also proved, that iron could be taken out of water by the Clark process, or by using one of the mechanical contrivances which had been designed for the purpose. In one well with which he had to deal while at St. Helens, the water was very heavily charged with iron; and it was doubted whether the Clark process would remove the lime and magnesia. He proved conclusively that it could. The water when taken from the well was beautifully bright and clear. About an hour afterwards, it began to get cloudy white; and, after standing six or seven hours, it deposited in the bottom of the vessel a light brownish mud, which was a precipitation of lime and iron. Both could be removed by the Clark process.

Mr. W. MATTHEWS (Southampton) said he could confirm what the President had said about the throwing down of iron by the softening process. There was a marked example of it at Wellingborough, where Mr. Sharman was dealing with one of the most difficult waters, impregnated with iron and other salts. Since adopting the softening process, they had there got rid of the whole of the iron; and the water that had been wasted by many thousands of gallons could now be used almost to the last drop. The softening was also a great advantage in getting rid of micro-organisms from the water. Dr. Percy Frankland had experimented very largely in this direction, and had conclusively proved that, even with pure water coming from a well, and containing probably the smallest possible number of micro-organisms in the initial state, these few were reduced almost to *nil* by the use of the softening process—that the carbonate of lime and magnesia, in being deposited and precipitated, carried down with them all the micro-organisms. So Dr. Frankland had laid it down that a water taken from the chalk, and softened by any of these processes, became absolutely the purest water it was possible to obtain. There was one other point in connection with the paper to which he should like to draw attention. Engineers were expected to have the samples collected which were to be submitted to the chemist; and he could not enforce this point too strongly—the absolute need of the greatest care in taking the samples. He had seen a great divergence of results from waters drawn from the same source, and submitted to two or three different chemists. He thought the chemists should, in their own interests, be careful to see that qualified people collected the samples, because, off-hand, one was apt to suggest that one or other of the chemists had made a serious mistake. Too little care was exercised. Samples of water were taken, and perhaps kept in an office two or three days; and any chemist would tell them that, in the case of a sample which had been kept for 24 hours, the correct estimation of some things—especially the free ammonia—was absolutely impossible. So they should urge that great care should be exercised in seeing that the vessels were clean; that the stoppers were not handled; and that the samples were sent at once to the chemist.

Mr. C. H. PRIESTLEY (Cardiff) remarked that Dr. Percy Frankland sent out very minute instructions as to the collection of samples; and if they kept to these, there could be no difficulty whatever in the way referred to by Mr. Matthews.

Mr. C. E. JONES (Chesterfield) emphasized the necessity for vigilance and carefulness in the taking of samples. He remarked that some of the results obtained by analytical chemists were certainly very wonderful; and if these were correct, their assertions went very largely to prove the truth of the Biblical passage that we are "fearfully and wonderfully made," as we should otherwise have been dead many years ago. (Laughter.) The waters of most of the rivers had been condemned; and the well waters did not appear to find much favour, though he (Mr. Jones) was strongly of opinion that the latter would come to the front again by the sheer force of necessity, seeing that the large watersheds were being so very extensively appropriated.

Mr. J. RADCLIFFE (Todmorden) spoke of his experience as to the hardening of water to prevent lead-poisoning. The method he adopted to harden the water slightly was the adding of whiting or carbonate of lime in a finely powdered state. Before adding the limestone, they had found particles of peat in suspension; but after it had been added, and allowed to precipitate, the effect on the water was most wonderful. It had a bright and beautiful appearance; and the quality was much improved.

Mr. H. ROBERTS (Ipswich), referring to the collection of samples of water for analytical purposes, said the practice in his case was for the sanitary inspector to notify him when he was going to take samples; and he (Mr. Roberts) accompanied him. The bottles were well washed by the water of which the Inspector wished to take samples; and the samples were then delivered without delay to the analyst.

Mr. J. STORR (Wrexham) pointed out that the title of the paper was "The Interpretation of Results of the Chemical Examination of Water." That was a question upon which he thought no two chemists could possibly agree. In support of this, he might say—simply going upon the question of nitrates and nitrites—that he took samples of water himself from moorland; and two chemists disagreed as far as it was possible to disagree. One condemned the water *in toto* in consequence of the nitrates and nitrites; while the other stated that it was a perfectly pure and wholesome moorland water. When considering the results of analyses by chemists, they must apply a little common sense, or else the engineer would get too much tied by the chemists.

Mr. A. F. BOWKER (Mid-Kent Water Company), alluding to the remarks of the President as to the deposition of the iron in water, said he had to deal with a water that contained a considerable amount of iron; and he was unable to deposit it by the lime process. The water contained about 9° of hardness before treatment, and 1¼° to 2° afterwards. This treatment was especially for manufacturing purposes.

The PRESIDENT was of opinion that Mr. Bowker did not continue the treatment far enough. As to the paper, he had hoped that Professor Clowes would have given them something to guide them in the interpretation of the figures placed after the different items in an analysis.

The following is an abstract of the paper by Mr. T. MOLYNEUX (Stockport):—

THE STOCKPORT DISTRICT WATER-WORKS: DESCRIPTION OF BOREHOLE, ETC., NEAR WILMSLOW.

Stockport and the surrounding district—an area of 71 square miles, with about 125,000 inhabitants—is supplied with water from three sources—the northerly portion by water received from the Manchester Corporation reservoirs, in the Longdendale Valley, under a special agreement, to the extent of 1 million gallons per diem; and the south-easterly, by gravitation from two reservoirs in a valley near Disley. These reservoirs hold 158 million gallons of water, which is collected from a gathering ground 1500 acres in extent, with an average rainfall of 45 inches. That portion of the district which lies to the extreme south-west was supplied with water prior to 1894 from a 9-inch borehole, 180 feet deep, in the new red sandstone near the village of Wilmslow; the yield being 200,000 gallons every 24 hours. During the exceptional drought of 1893, it became necessary to supplement these existing supplies by water obtained from some of the numerous boreholes which are to be found in and around the borough of Stockport; and, in order to prevent a recurrence of that experience, the question of obtaining a further quantity of water was considered.

The district lies for the greater part on good water-bearing strata—the new red sandstone series; and this, therefore, was the source looked to to provide the necessary increased supply—the site chosen being adjacent to the existing borehole at Wilmslow. Messrs. E. Timmins and Sons, of Runcorn, and another firm, were requested to tender for the finding and raising, by means of one or more boreholes, a supply of about 1,500,000 gallons per day. This they did; Messrs. Timmins suggesting two boreholes, each to supply 750,000 gallons. As half the total quantity was considered to be sufficient for several years to come, only one borehole was ordered. The work was commenced on May 8, 1894; and by Nov. 9 of the same year, the 750,000 gallons was estimated to be available—the borehole having reached a total depth of 602 ft. 3 in.

The works consist of a well, 9 feet inside diameter, 21 feet deep, lined with 14-inch best Staffordshire blue bricks, set in cement, filled in behind with grout and coped with ashlar; the floor being made of 18 inches of cement concrete. Into and through the floor, a cast-iron stand-pipe is fixed, 29 inches bore, 9 feet long, and flanged on top. The borehole for 111 ft. 9 in. is 28¼ inches in diameter, and lined with 25-inch bore steel tubes; the annular space being filled in with cement. This portion was lined to prevent any possible contamination from surface water or the River Bollin, which runs within a few yards of the borehole. Before these lining tubes were put in and cemented, water was flowing from the hole at the rate of between 4000 and 5000 gallons per hour. This was effectually shut out; and, therefore, for any water to get access to the borehole, it must percolate through about 130 feet of sandstone. From the bottom of the lining tubes for 469 ft. 6 in., the hole is 14 inches in diameter, and is in the bare rock. When work ceased at the boring, and the water was allowed to accumulate in the borehole and stand-pipes, it rose to the level of the surface of the ground. This level was considered to be the

rest-level of the water. But to obtain an accurate estimate, surface pumping was continued for 48 hours to lower this level if possible, with the result that the yield of water flowing into the well, when the depth of boring was 602 ft. 3 in., was found to be 9000 gallons per hour when pumped below its rest-level until the head of the valve was 11 feet. Therefore this would give, in accordance with the well-known hydraulic formula, $\sqrt{11} : 9000 :: \sqrt{121} : 29{,}880$ gallons per hour, or 717,120 gallons per 24 hours. This test was considered satisfactory.

The land on which it was proposed to erect the engine-house, &c., formed a garden sloping rapidly down to the river; and as in time of heavy rain the river rose rapidly and overflowed, it was decided to erect a strong river-wall, and raise the level of the whole of the land to that of the then existing engine-house. One portion of this wall is utilized for the side wall of a tank, which receives the water as it is lifted up the borehole. Its capacity is 100,000 gallons; being 58 feet long by 22 ft. 2 in. wide along centres at the floor-level, and holding 11 ft. 9 in. of water. Along the middle of the tank is a 14-inch midfeather wall of blue brick set in cement carrying the girders of the roof, but not extending to the end of the tank farthest away from the inlet from the pump; thus causing the water to continually circulate, as both inlet and outlet are at the same end, though on opposite sides of the midfeather. The water, after circulating round the tank, passes through 12-inch pipes from the bottom of the tank, there being a sump-hole at the mouth of the pipe, across the yard into a cast-iron well on the top of the old borehole. From this well it is forced direct into the mains by means of three force-pumps, the first two of which are direct-acting—one made by Messrs. Tangye, 12 inches diameter, 3-feet stroke; a second, by Messrs. Pearn, 12 inches diameter and 2 ft. 6 in. stroke; and a third, by Messrs. Mather and Platt, which has three 4-inch rams, with 8-inch stroke. The Tangye and Mather and Platt engines are also coupled direct to the old borehole. The two larger pumps work against a head of 200 feet; and Messrs. Mather and Platt's, against 400 feet. By means of these force-pumps, water can be supplied, if necessary, to about one-third of the whole district of supply.

The water is raised from the borehole by means of a lift-pump; the working barrel of which is fixed 121 feet from the surface. The pumptrees, which consist of nine lengths of steel tubes 10 feet long (19¾-inch bore), screwed and coupled together, are suspended from the stand-pipe fixed in the floor of the well—the uppermost length having a casting screwed on with a flange, which is bolted to the flange on the stand-pipe. The bottom length is screwed into a gun-metal working barrel, 7 ft. 6 in. long and 18¾-inch bore; the maximum stroke being 4 ft. 6 in. To the foot of the working barrel is fixed the clack-box; and to this about 22 feet of wrought-iron suction-pipes, 12 inch bore, are screwed, which go down into the unlined portion of the borehole. The clack consists of a hollow casting, tapering at the bottom to fit the seat in the clack-box; the tapered portion being covered with leather, with four vertical webs to a boss, through which the wrought-iron spindle passes on which the valve works. The valve is made of gunmetal, the webs being set at an angle of 60°, which cause the valve to rotate on being lifted, thus equalizing the wear on the faces. The valve lifts 1¾ inches each stroke. The bucket is of the same construction, and is, in addition, supplied with three gun-metal rings similar to ordinary piston rings. The bucket is fastened by means of gibs and cotter to a cap bolted to the ends of the lift-rods, which consist of seven lengths of pitch pine, 8 inches square, plated, and bolted together. These rods are suspended from the bottom of the ram—a hollow casting 6 ft. 6 inches long by 14 inches diameter.

On the top of the suspended pumptrees, there is bolted a casting, with branch, which is the delivery from the pump. To the branch is attached a reflux-valve, which prevents the water following the ram on the down stroke. Above this valve are seven lengths of 15-inch pipes, which deliver the water into the inlet of the tank, or into the river through a branch when required after a stoppage, or any repairs. There is also a branch to supply the condensing-well in case of the failure of the river water. To the delivery casting the gland of the ram is bolted. Fastened round the upper portion of the ram is a casting carrying a steadying slide, which works in a vertical slide fixed between two girders let into the sides of the well. The ram is suspended by means of a hanging rod, similar to the other lift-rods, working at both ends on a centre, to one end of a double L-leg or T-bob, which is made of wrought-iron plates bolted together; and to the other end is hung a balance-weight of 2½ tons, which equalizes the weight of the lift-rods, ram, and water. The T-bob swings on plummer blocks fixed on two girders, one end of each of which is bolted to girders across the top of the well; the other ends being bolted to heavy stone beds.

The engine which drives the pump is a compound tandem, of about 35 nominal horse power. The cylinders are 8 inches and 14 inches diameter; and the stroke is 22 inches. It is of the latest type, and fitted with Proëll's automatic expansion gear. The power is communicated by means of a pinion on the fly-wheel shaft to a mortice-wheel, on the shaft of which is the crank, to which the push-rod is attached. The water for condensing purposes is obtained from the River Bollin, passing into a well after being strained, from whence it is lifted.

The engine-house is substantially and well built of red brick; the foundations being on 18 inches of concrete on the rock throughout. The engine foundations are all of concrete on the rock, faced with 4½-inch brickwork; the beds being of Runcorn sandstone. When building this house, it was decided to make it sufficiently large for duplicate plant when necessary. The old boiler-house has been enlarged; and a more powerful boiler fixed, of the Lancashire two-flued type, with four tubes in each flue. It is 26 ft. by 7 ft. diameter, and will carry 120 lbs. steam. Up to the present, there has been no appreciable diminution in the yield of the adjoining well. The new pump has been for the last two months working at the speed of 8½ strokes per minute, and has been lifting, according to the guagings at the inlet of the tank, in excess of the calculated yield. To give the 750,000 gallons, the speed should be eleven strokes per minute, which allows 10 per cent. for slip. The total cost of the work has been about £6000.

Discussion.

Mr. Percy Griffiths (London), in a lengthy criticism of the paper, said the author had stated that the amount of water available from these new works was 750,000 gallons per day; and, working this out at an allowance of 20 gallons per head, the population supplied would be 37,500. The new works cost £6000; but the author had not given them many details as to what was included in this sum. It would be interesting to have these, as £6000 to supply 37,500 people was somewhat phenomenal. He inquired why river water was used for condensing purposes. It was difficult to see why, with a surface condenser, the borehole water was not applied to this purpose, instead of the river water, which involved the running of piping from the river into the old well, and pumping it out again. The engine used was an ordinary high-pressure compound one, with gearing. That was a very common type for small works; but when they came to works of this magnitude, they usually liked to improve, if possible, upon the gearing. He congratulated the author upon his good fortune in having such a splendid sub-soil to deal with; and then asked why the force-pump power was distributed among three pumps, and at the same time why the force-pump was not combined with the new engine. There would be considerable economy effected by combining the force-pump with the existing engine. The necessary losses in working any engine were more or less a constant quantity; and by multiplying the engines, the cost and waste were multiplied. He could not see why three force-pumps were worked for lifting the water from the level of the pumping-station to the district, instead of one or at most two working alternately. The author stated farther on that to a branch of the pump was attached a reflux-valve, which "prevents the water following the ram on the down stroke." He (Mr. Griffiths) did not understand the expression, because the author had already described a clack-valve below the bucket; and he could not see how the water could follow the ram down—it was bound to go away from somewhere. It must not be taken that he was criticizing the reflux-valve, because it was an extra precaution, or safety-valve, and was an excellent thing; but he certainly could not understand the expression referred to. He further asked whether there was any considerable variation in the water-level of the boring. The pump appeared to have been fixed at something more than 120 feet below the surface; and it would be interesting to know whether the water (which appeared to have risen to very nearly the surface level) varied sufficiently to justify putting the pump to that considerable depth.

Mr. W. Matthews (Southampton) asked whether the author could separate from the total expenditure the cost of sinking the boreholes and the well; because, looking at it roughly, he should have thought that the cost of the well, and boring to such a depth as in this case, would have nearly absorbed the £6000. Another point was that the borehole was 28½ inches diameter, and was lined with 25-inch steel tube. Was there any particular reason why there should be a 3¾-inch clearance left between the diameter of the borehole and the tubes? Then along the middle of the tank there was a 14-inch midfeather wall. The author told them that the water was continually circulating, and that the tank did not contain a day's supply. This wall seemed to him to be rather a piece of extravagance and unnecessary, particularly as there appeared to be some slight amount of deposit in the water; and the lower rate of velocity through the tank would have been an advantage in getting rid of it. The three force-pumps and another pump such as the author had down in the well was a largely divided plant to deal with 750,000 gallons of water. If he could have got the work done by a duplicate set of larger engines, it would have been much better. He inquired the cost of raising the water per thousand or million gallons; and expressed the opinion that automatic expansion gear in connection with pumping-engines was totally unnecessary.

Mr. W. G. Peirce (Richmond), speaking of the water required for condensing purposes, remarked that Mr. Griffiths had asked why the author did not use a surface condenser, instead of taking the water from the river. His own experience was that, if it was possible to get water from an easy source—such as a river—it was much better to do so, because he could not see why they should have to raise the temperature of the water (say) 3° when there was no necessity for it. Besides, the condensers were very expensive.

Mr. J. Shaw (Boston) pointed out that the author spoke of the pumps as direct-acting; and he asked if they were Tangyes "Special" type. If they were direct-acting, it seemed to him

there was a great deal of power lost. He agreed with Mr. Peirce as to the use of river water for condensing.

Mr. E. A. B. WOODWARD (Wolverhampton) observed that the author gave the average rainfall on the gathering-ground as 45 inches; but he did not state when the average was taken—whether it was within, or prior to, the dry seasons. He also thought 10 per cent. for slip was a large allowance.

Mr. W. INGHAM (Torquay) and Mr. W. A. RICHARDSON (Birkenhead) asked for information as to the coal used; but, as will be seen by his reply, this Mr. Molyneux was unable to supply.

Mr. GRIFFITHS explained that his objection to condensing in the way described by the author was simply owing to the fact that the water had to be lifted twice.

Mr. MOLYNEUX, in reply, said the cost of the work was approximately £6000; and it included the river wall, the tank, and new boiler. The force pumps had been in use at the private boreholes in times of drought; and rather than go to any extra expense, they put them in. The direct-acting pumps were about ten years old, and were sufficient for the purpose. They considered the question of having a surface condenser; but it was dismissed, on account of the cost. Regarding the reflux-valve, if there had not been one, the weight of the water would have been on the ram; but with this valve, it was taken off—to a certain extent anyway.

Mr. GRIFFITHS: Not when the valve is open.

Mr. MOLYNEUX: The valve would shut immediately. Proceeding, he said he could not say whether there was any difference in the level of the water in the well, as the borehole had been sealed up ever since it was started. But the yield had not differed; and the pump was working now as it had always done. When the boring reached 602 ft. 3 in., and before the machinery was fixed, the water did rise to the surface level; but when they had pumped for 48 hours, they lowered the level 8 feet. They therefore put the pump low enough while they were about it to cover any emergency. Mr. Matthews remarked upon the clearance left behind the 14-inch brickwork. The whole of the excavation, when they got 4 feet in, was water-bound; and the pumps had to be kept going continuously all the time the work was proceeding. The well was only 9 feet in diameter; and square bricks were used. The wall was put in, and then grouted behind to make a thoroughly water-tight job; but it was not found to be quite so even now. Respecting the flow of the water in the tank, it was so slow that, having to travel all the way round, it gave longer time for the water to settle. The Tangye pump was of the "Special" type. Concerning the rainfall, previous to the dry seasons it was 47 inches; and to put it approximately, he had taken 2 inches off. The average for nearly 40 years was 45 inches. As to the coal used, they had not had a single day's test. The engine had not yet been indicated, as immediately they obtained the water they set to work pumping, and had only stopped about an hour each night since. The 10 per cent. slip for the pump was taken in order to be on the safe side.

At the conclusion of the discussions, the authors of the papers were heartily thanked.

The Sale of Fertilizers in New York.—An Act has lately been passed, and has come into operation, for governing the sale of fertilizers in New York. Every person who offers for sale any material to be used as a fertilizer, the selling price of which exceeds $10 per ton, is to stamp on or affix to the packet containing it a statement setting forth, among other particulars, the chemical composition of the fertilizer expressed in the following terms: (1) Percentage of nitrogen; (2) percentage of available phosphoric acid; (3) percentage of potash soluble in distilled water. It is to be deemed a violation of the law if these percentages are found to be deficient to the extent of more than 0·3 per cent. in the case of nitrogen, or 0·5 per cent. in respect of phosphoric acid or potash. As prices stand at present, such materials as nitrate of soda and sulphate of ammonia come under the provisions of this law.

Lowering a Water-Main while in Use.—At the last meeting of the American Water-Works Association, Mr. D. W. French described the method employed by him in lowering a 20-inch water-main while it was in use under 120 lbs. pressure in Hackensack. It was the force-main from the pump to the reservoir, and it would have been more convenient to cut it off and lower it in sections; but as this would involve the cost of new pipe and other expenses, it was determined to lower it without interfering with its use. The pipe was 1100 feet long, and it had to be dropped 6 feet. First a valve was put in, and a 2½-feet trench was dug under 300 feet of the pipe; leaving bridges of earth under each length. Three men were stationed with picks to gradually undermine the pipe at each bridge simultaneously. It was lowered about 15 inches at a time; and it was kept straight for lengths of 150 feet. Jacks and blocking were used to prevent the pipe from springing too much sideways: There was practically no loss of water by leaking, and no derricks were used. The men were very expert; and as the pipe had become bowed somewhat, a few months later the trench was opened, and the pipe was cut in several sections and lined up—showing that it had moved endwise 4½ inches. The cost of lowering, retrenching, and straightening was about £116; and it was conducted alongside a railroad without interrupting its operations.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Testing of London Gas.

SIR,—I have to thank Mr. Livesey for the altered tone of his last letter (*ante*, p. 176), which is in marked contrast to the opening note of his first. Mr. Livesey maintains that there has been no attempt to answer his view of the proper interpretation of the testing clauses in all Acts of Parliament. This I presume is to be read with the concluding remark of his letter: "I hold that Parliament intends the gas to be of the prescribed quality at the testing-stations, and not necessarily at the consumers' burners." This is the point of the whole matter, and the only one on which I have desired to dwell. If anything in my casual remarks in the reply to the discussion of my paper read before an assembly of gas engineers can be construed as unfair, I can only regret it; but I maintain, with all respect, that my remarks were in keeping with the point raised, and that they were true. Furthermore, they are borne out by Mr. Livesey himself.

Mr. Livesey maintains that the gas supplied to the consumer need not be of the same quality as that tested by the official examiner. In my humble opinion, this contention is unworthy of its exponent, and, if followed to its logical conclusion, means that the sample shall not represent the bulk! It is this dangerous doctrine which I desire to combat most strenuously. I quite admit it is possible that, under certain circumstances, gas will deteriorate in its passage from point to point; but if advantage is to be taken of this fact to systematically supply a quality far inferior to that prescribed by the Act, and if this action is to be defended on the ground that it is the gas at the testing-places only which is meant as being defined by the Act, I am bound to say that such a contention is wrong in itself and unjust to the consumer, and that anyone who protests against it is only doing his duty.

Mr. Livesey says I have misquoted him verbally. Here are his words and my quotation: "In order that the defect may be remedied as soon as possible;" "to have the defect remedied at once." My quotation is, "the defect can be remedied at once."

There is one point which I desire to set right. Mr. Livesey evidently is of opinion that in some way I personally influence the action of the gas examiners. If this be so, I must be possessed of some mysterious power of which I was not hitherto aware. My view of the matter is, and always has been, this: The examiner is an officer appointed under the Act, and is in the position of a legal assessor whose decision is final unless upset on appeal. No one, whether company or controlling authority, has a right to go between him and his work, so long as he strictly carries out the Instructions of the Gas Referees. All that I, as the agent or servant of the controlling authority, have to do is to see that the staff of examiners do so carry out the Gas Referees Instructions, and that, generally speaking, they attend to their duties, and are properly supplied with all requisites necessary thereto. So far as I am aware, no return has ever yet been made, or I trust ever will be made, which has been influenced directly or indirectly by me in any direction other than strictly in accordance with the Acts of Parliament and the Instructions of the Gas Referees. In this I do not think I have laid myself open to the charge of having suggested to an examiner that "he should do his best for his employers," and "make the quality as low as he can." When Mr. Livesey re-reads these words, I think he will regret having written them. Had I ever inculcated such an abominable thing, I should be unfit for the position I am proud to hold.

40, *Craven Street, W.C., July 29, 1896.* W. J. DIBDIN.

Mr. Damon and the Evans Photometer.

SIR,—I thank Mr. Sugg for his criticism of my letter in your issue of July 7. I am quite willing to credit him with honesty of purpose, and will therefore pass over his opening and other similar statements, however apparently unfair to myself, and deal at once with the photometer, and the testings at the Ladbroke Grove station.

To commence with, I will inform Mr. Sugg that the photometer was altered by me in various ways purely for experimental purposes. These experiments were repeated at the special request of the Gas Referees, who afterwards certified the continued use of the photometer in the form in which I found it to give the most constant results. Indeed, they went farther, and cut large openings directly under the gas and the candles; in that way making it, in effect, an open instrument, more completely than in the form in which my experiments left it. This justification of my work speaks for itself. Mr. Sugg will thus see that the *legal* alteration was made by the Gas Referees, and not by myself, the examiner. "Judicious tinkering" is therefore an expression which I leave to the Gas Referees.

I regret that Mr. Sugg gives me so little credit as a photometrist. In the Ladbroke Grove experiments, the disc was carefully shielded from reflection; and the candles showed considerably less tendency to gutter than when the instrument was in its unaltered form.

I am not at all surprised at the obvious fact brought out in Mr. Sugg's reference to the Jewry Street case. Here is a photometer that gave low results. In another place—Fenchurch Street—this same instrument gave presumably correct results. Can anything be said in favour of a photometer which will act so erratically according to locality? and how can Mr. Sugg continue to advocate an instrument thus shown to be capable of such variations? I do not doubt the fact that such a photometer is found to give correct results in his large and *well-ventilated* testing-room; but how will it behave elsewhere? In my opinion, no better proof can be wanted to bear out the argument that it is past understanding that an Evans photometer is now anywhere tolerated.

It is well known that the adoption of the Evans photometer was due to the fact that Mr. F. J. Evans required a photometer for testing the illuminating power of the gas in the open air. This instrument was subsequently introduced into various testing-stations, and among others some of the present official testing-stations in the County of London. But of late, in new stations, the Gas Referees have prescribed the open bar, or Tooley Street pattern of photometer. Of

course, in those stations where the Evans photometer is still in use, they have been so altered (in accordance with the instructions of the Gas Referees) as to ensure better ventilation.

I desire to make it perfectly clear that my sole object is to help, in any way possible, towards the establishment of a standard instrument which shall be universally used, and which, when employed with a reliable standard, such as the pentane argand, will place photometry on a fair basis, yielding results within (say) 1 per cent., whereas at the present time it is admitted on all sides that there is no certainty that the results are within 10 per cent., and in some cases even more.

In conclusion, I did, and do, maintain that the photometer in use in Dublin is not an Evans photometer, as invented by Mr. Evans; and that it is of such a form as to give an artificial value to the gas.

ALFRED F. DAMON,
Gas Examiner to the London County Council.

123, *Ladbroke Grove, July* 31, 1896.

Inclined-Retort House for the Leeds Gas-Works.—The Gas Committee of the Leeds Corporation last Tuesday considered tenders sent in for the erection, at the Meadow Lane works, of a new building for the housing of the inclined retorts which are to be introduced there. Subject to the approval of the City Council, contracts were let amounting in the aggregate to £9432.

The Lamp Manufacturing Company, Limited, in consequence of the continued increase of their business, have taken the adjoining house, so that their address will in future be Nos. 10, 12, & 14, Leonard Street, E.C. It will be opportune to mention that the Company's new patent railway roof lamp (the "Coligny"), for burning compressed oil gas, is finding increased favour with the railway companies; orders for a considerable number of these lamps being now in hand for the Lancashire and Yorkshire Railway, the South-Eastern, the London and South-Western, and the Belgian State Railways.

St. Annes Gas-Works.—The St. Annes District Council have passed a resolution declaring the advisability of the town becoming possessed of the undertaking of the local Gas Company. The Company was registered in 1875 with a capital of £15,000; and it now stands at £23,144. The annual consumption of gas is about 17 million cubic feet; the number of consumers, 500; and the gross annual profits, £1200. The Company, under agreement, undertake the public lighting of St. Annes, and also supply the tram receiving and compressing station for charging the new gas-traction tramcars. The charge for gas is 4s. 6d., with 3d. discount for lighting, and 9d. for cooking.

Cambridge Gas Company.—The Chairman of this Company (Mr. Dennis Adams), in addressing the shareholders at their recent half-yearly meeting, stated that the past half year had not been a good one for them for various reasons; and they had had to dip into the reserve fund to assist in paying the dividends. The bad period had been due to several important reasons. It had been very warm and light since Christmas; and consequently they had not made so much gas. Of course, they had carbonized less coal; and therefore they had saved a little in that respect. Another heavy expenditure was in consequence of the sewerage works, which caused a considerable breakage of pipes. Many of their pipes were exposed. It was found that they were not likely to last long; and their Manager (Mr. O. J. Weeks) considered it desirable to remove them while the ground was open. This was an expenditure of which they would get the benefit afterwards. Then the rates had been increased by £150. Taking into account the exceptionally bad weather they had had for gas consumption, he thought they might congratulate themselves upon getting off so well as they had done. The report was adopted; and dividends of 10 and 7 per cent. were declared.

Littlehampton Gas Company, Limited.—The accounts of this Company for the year ending June 30 have been issued. They show an income of £4336, of which £3511 was received from the sale of gas. The expenditure amounted to £3054, so that there is a balance of £1282 to be carried to profit and loss account. The amount standing at the credit of the latter is £1549, from which the payment of dividends of 10 and 7 per cent. is proposed. The quantity of gas made during the past year has been 18,684,000 cubic feet; being an increase of 758,000 cubic feet over the preceding year. The quantity unaccounted for was at the rate of 12·97 per cent. Owing to the steady increase in consumption during the last few months, the Directors have decided to make a reduction of 2d. per 1000 cubic feet on Oct. 1 next. The Directors report that during the past year Captain E. H. Hills, R.N., who had for many years acted as Chairman of the Company, retired from the directorate to their great regret; and Mr. W. Waite resigned his position as Manager. Mr. C. Bartlett was appointed Chairman, and Mr. A. W. Elton was selected from a large number of applications as Manager and Engineer. The Directors add that they have every reason to be well satisfied with their choice.

"Reformers" at the South Metropolitan Gas-Works.—Last Thursday, a number of members of the London Reform Union paid a "citizens' visit" to the South Metropolitan Gas-Works in the Old Kent Road. They were, of course, welcomed by Mr. George Livesey, who, before conducting the party round, took the opportunity of enlightening them on the subject of gas supply. He explained at the outset that it was the desire of the Company to sell gas at as cheap a rate as possible; while in regard to quality, he did not say it was of uniform 16-candle power per burner, but it was as good as they could supply without resorting to methods which would increase the cost of gas to the consumers. Your "reformer," as a rule, is a little cranky on Municipalization; and Mr. Livesey did well to "speak the word in season" on this subject. His hearers must have stood aghast when they heard him say he thought the owning of gas-works by municipalities was a very doubtful advantage to the ratepayers. Of the two systems, the Scotch—that of supplying the gas at cost price—was, he said, the honest one; while the English, which made a profit to be devoted to the reduction of the rates, was simply robbery of the consumers. It would be a bad thing, he added, for London, if the gas supply of the Metropolis ever passed into the hands of one great controlling body, either private or public. He also gave his visitors a great deal of information on the Company's profit-sharing system.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills reported, with amendments: Barry Urban District Council Bill, Staines Reservoirs Bill.

Bills read the third time, with the amendments, and passed: Bilston Improvement Bill, New River Company Bill, South Metropolitan Gas Bill, Staines Reservoirs Bill.

HOUSE OF COMMONS.

Monday, July 27.

THE EAST LONDON WATER SUPPLY.

Mr. H. S. SAMUEL asked the President of the Local Government Board whether he could give the House any information as to the result of his endeavours to obtain from a neighbouring Water Company a supply of water for the East London Water Company sufficient to enable them to carry out the obligations they are under to their customers.

Mr. PICKERSGILL asked whether the right hon. gentleman was aware that, while the East London Water Company published notices restricting the supply to six hours a day, they did not specify the hours; and that in the previous week, in various parts of the East-end, water was turned off without any notice whatever. Would the right hon. gentleman impress on the Company the importance of giving adequate notice as to the hours?

Mr. CHAPLIN: I have already done that, and I have put all the pressure I can upon them; and no doubt effect will be given to the representations. I have not yet received any information which enables me to state that a definite arrangement has been made; but I am doing everything I can to bring about an agreement between the two Companies concerned in this matter.

Tuesday, July 28.

INCREASED ASSESSMENTS AND THE CHARGE FOR WATER.

Sir H. VINCENT asked the President of the Local Government Board if his attention had been called to the frequent cases in which the London Water Companies raise their charges for the supply of water because the increase in the rates had necessitated a higher rateable assessment, without giving any additional supply, and to the allegation that the profits of the Water Companies had been thus greatly increased; and if, in dealing with the water question in the Metropolis, he would see that steps were taken to relieve consumers from this extra burden, and to regulate payment for water by its supply, as in the case of gas and electric light—provision, if necessary, being made for the use of a minimum quantity of water for sanitary purposes.

Mr. CHAPLIN: The charges the Companies are authorized to make for the supply of water for domestic purposes are regulated by the Local Acts of the Companies and the Water-Rate Definition Act, 1885. They depend to a great extent on the rateable value of the premises supplied. It would, no doubt, happen that, if the rateable value of a house was increased without any circumstances requiring an additional water supply for domestic purposes, the Company would benefit by the change. On the other hand, where a house becomes diminished in value, as, for instance, in consequence of a change in the character of the neighbourhood, and the rateable value is reduced, the Company lose by the alteration. I have no means of forming an accurate opinion as to the extent to which the different London Water Companies are affected by such changes. The present system of charge is generally in force throughout the country, not only where the water is supplied by companies, but also where it is furnished by corporations and other local authorities. I may point out that, if the rates for water supplied for domestic purposes were regulated, as suggested, by the quantity consumed, the effect would be to increase the charges for water supplied to the poorer and more crowded dwellings, while it would reduce the charges on the larger houses. I do not feel myself able to give the pledge which my hon. friend desires.

Thursday, July 30.

THE EAST LONDON WATER SUPPLY.

In answer to questions by Mr. SAMUEL and Mr. PICKERSGILL,

Mr. CHAPLIN said he was informed by the East London Water Company that the meter supplies from the service-mains in their district were treated precisely in the same way as the supply upon fixed rates, and were subject to the same restrictions as to hours of supply. Both meter services and any others on the leading or fire mains, which were constantly charged, had necessarily an uninterrupted service. In answer to a telegram, he had been informed that no restrictions had been placed upon the Vestries as regards the supply of water for flushing the sewers. As to obtaining a supply from the New River Company, no answer had been received to the second application of the East London Company. They had no knowledge of any increased sickness due to the restricted supply of water; nor had he any information to this effect.

Colonel LOCKWOOD asked whether it was not a fact that the Company were prepared to fix additional stand-pipes whenever and wherever required by the local authorities.

Mr. CHAPLIN: The Company have signified their perfect readiness to do so, wherever required.

In answer to Mr. COHEN,

Mr. CHAPLIN said: I am informed by the East London Company that the hours of turning on the water vary in the different streets throughout the district, but that in each street the water is supplied at the same time from day to day. The general rule is that the water is turned on as nearly as possible for three hours in the morning, and

again for three hours later in the day. In some cases there are additional times of service. With respect to pressure, it is stated by the Company that at the works it is higher than it has ever been before; and that the automatic diagrams traced at various points show a good and sufficient force. Further, if any deficient pressure exists, it can only occur where there is great waste in any particular street; and this must be due to the fact that all the taps, or the majority of them, are left running at one time. No complaints, it is stated, have been made to the Company in this matter. A very large proportion of the dwellings in the district supplied by the Company have no proper storage cisterns; and where there are no such cisterns, it is the case that there is no supply of water available for sanitary purposes during a large portion of the time when the water is turned off, except waste water and such supply as may be provided by storage. The best recommendation I think I can make to prevent a recurrence of this calamity is the speedy completion of the additional works which were contemplated by the Company in 1893, but which were arrested at that time by the action of Parliament.

Friday, July 31.

Mr. SAMUEL asked the President of the Local Government Board whether any arrangement had been come to between the New River Company and the East London Water Company in regard to the water supply of East London.

Mr. CHAPLIN: Yes, Sir. I am glad to say that within half an hour of answering a question on that point in the negative yesterday, I received a telegram informing me that the two Companies had come to an arrangement by which the New River Company would be able to provide the East London Company with an additional supply of 3 million gallons daily. (Cheers.) I may also state what I think will be generally satisfactory to the House—that the East London Company have readily agreed to the suggestion I made to them some few days ago. The Directors, I understand, met yesterday; and this morning I received a communication from General Scott, the Water Examiner to the Board, to the following effect: "The Secretary has informed me that the Directors are most anxious to do all in their power to alleviate any distress occasioned by the present drought, and that the Company will undertake to defray to any reasonable extent the cost of distributing receptacles for storing water to the poorest class of householders who do not possess vessels suited to the purpose. The Secretary will communicate at once with the local authorities with a view to giving effect to their intention."

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, July 31.

(*Before Mr. Justice* CHITTY.)

Dellwik's Patent for Incandescent Gas Lighting.

Mr. BYRNE, Q.C. (with him Mr. BOUSFIELD, Q.C., Mr. R. WALLACE, Q.C., and Mr. C. E. E. JENKINS), applied on behalf of the New Incandescent Sunlight Patent Gas Lighting Company, Limited, who are the assignees of Dellwik's letters patent, that they might be added as respondents to a petition which had been presented by the Incandescent Gas-Lighting Company, Limited, for the revocation of the patent.

Mr. MOULTON, Q.C., who, with Mr. TERRELL, Q.C., and Mr. WALTERS, appeared to oppose, admitted that this application was a matter of course.

Mr. BYRNE said he had also to ask for liberty to apply to the Patent Office for leave to amend the letters patent, and that the trial might be postponed until after the amendment had been made. Mr. Duncan, one of the Directors of the Company, had made an affidavit in which he stated that the new Company, who had purchased the letters patent belonging to the Sunlight Company, were desirous of applying to the Patent Office for leave to amend the specification by way of disclaimer, as without such amendment there was a risk that the patent might be held to be invalid on the ground that some of the processes described in the claim would be taken to be impracticable. The practical effect of the proposed amendment was to strike out all the materials except chromium.

Mr. MOULTON submitted that the application was one which ought not to be granted at the present stage. At the trial, when the true case was gone into by the aid of witnesses, the Court could consider whether or not leave should be granted. The proposed amendment was not an amendment by way of disclaimer, but rendered the grant one for a wholly different invention.

Justice CHITTY, in giving judgment, said that by accepting the argument that the application should stand till the trial, and assuming the assignees of the patent should succeed in obtaining amendment by way of disclaimer, he would probably postpone their obtaining that statutory indulgence for a year or so; and in the meantime they would be in possession of a patent which, according to their own showing, was invalid. The object was to cut down the specification by disclaimer to the extent to which it could be sustained; and the result of sending the applicants to trial bound hand and foot would simply be to incur unnecessary expense. If Mr. Justice Wills had held that Dellwik's patent was absolutely void from beginning to end, the case would have been different. But he had not done so. He merely said there was much rubbish in it; and it was to excise this rubbish that the parties required leave to go before the Comptroller. Whether or not what they did then would result in an invention within the proper scope of a patent, was a matter on which he (Justice Chitty) ought not now to pronounce any opinion. The leave applied for would be granted.

Leave to appeal was refused.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, July 30.

(*Before Baron* POLLOCK *and a Special Jury.*)

Payne v. South Metropolitan Gas Company—The Southwark Bridge Explosion.

This was an action to recover damages for personal injuries sustained by Mrs. Sarah Payne on Feb. 1, 1895, caused through an explosion due to an escape of gas from a pipe belonging to the defendants. The plaintiff alleged that the pipe was negligently laid; that it was defective in construction, inasmuch as it was fractured in two places; and that there had also been negligence on the part of the defendants in not ascertaining whether or not the earth round the pipe was properly laid and secured. A further charge of negligence was raised against the defendants in not detecting the leakage of gas from the pipe, which, it was said, had been escaping for some time. The defendants admitted that the plaintiff was injured by the explosion; but they denied that the pipe was negligently laid or was defective in construction. They admitted that it was fractured in two places; but they said the fractures were not known to them prior to the accident, and it was by reason of no negligence or breach of duty on their part that they were caused. The pipes were constructed of iron of proper quality, and were laid with all due care and skill. Prior to the accident, the defendants were not aware that the earth had been disturbed or negligently laid; nor could they, by the exercise of reasonable care and diligence, have discovered the same. They further denied that the gas had been escaping from the pipe so as to be capable of discovery by the exercise of ordinary care.

Mr. W. M. THOMPSON and Mr. J. D. A. JOHNSON appeared for the plaintiff; Sir EDWARD CLARKE, Q.C., M.P., and Mr. ATHERLEY JONES represented the defendants.

Mr. THOMPSON, in opening the case, said the negligence on the part of the defendants divided itself under the following heads: (1) That the gas-pipe in question was negligently laid, inasmuch as it was put at only a distance of 10½ inches from the surface of the road; (2) in not seeing that the pipe was properly supported; and (3) that care was not taken to ascertain that there was an escape.

At the conclusion of the plaintiff's case,

Mr. JONES submitted that there was nothing to go to the jury; negligence not having been proved on the defendants' part.

Baron POLLOCK asked whether the parties could not settle the matter amicably.

Mr. JONES said the defendants were only contesting the case with the view of establishing that there was no negligence on their part, either in the laying or the maintenance of their gas-pipes, or the measures which they took for the purpose of detecting the escape of gas. So long as it was understood that the plaintiff had failed to establish negligence, the defendants were willing to meet her in a liberal spirit.

Baron POLLOCK said he felt sure the Company would not contest the case except on principle.

The parties being unable to come to terms, the question of whether there was anything to go to the jury was argued at some length; and in the result his Lordship declined to withdraw the case.

Mr. JONES, in addressing the jury, said the defendants did not resist the action in any oppressive spirit towards the plaintiff, but defended it only because a very important issue was involved. The question was whether they had been guilty of negligence in respect of maintenance of gas-pipes which, by Act of Parliament, they had been authorized to lay in the streets of London. It was for the plaintiff to establish negligence and want of care on the part of the defendants. Gas companies did not ensure the public against accident. All they did was to exercise reasonable care that no accident should happen through defects in the mains, or by the acts of employees. He should prove by evidence that the depth at which the pipe was laid was not an unsafe one. The pipe, which was a 3-inch one, was made of cast iron, and was amply sufficient to resist all pressure that would be brought upon it under the ordinary conditions of street traffic. No evidence had been given to show that it was not adequately supported. The defendants had 800 miles of streets through which their pipes ran; and it would be an absolute impossibility for them to have any effective system by which they might for themselves secure knowledge of the opening of the roads by the local authorities or others. The only mechanical arrangement by which an escape of gas could be discovered was the human nose; and with a view of getting early information of escapes, the Company's practice was to give a small gratuity to anyone who informed them of an escape. It was plain that, in the present case, if the escape had existed for any time, it must have been detected by the lamplighter or a policeman.

Professor *Frank Clowes* gave evidence to the effect that the escape could not, in his opinion, have existed longer than two hours; and from information obtained from Mr. Livesey, he found that about 240 cubic feet of gas per hour would leak from the fracture in the pipe. Supposing the escape had been going on for a longer time, the gas in the boxes in the street would have ceased to be explosive. Air charged with 6 per cent. of gas would explode; but when charged with 30 per cent., its explosive character disappeared. The most highly explosive mixture was 14 or 15 per cent. Had the gas been escaping for a couple of days, there must have been a large quantity floating about, as half that which escaped would be in the air; and consequently it must have been detected.

Mr. *C. Howard*, the Chief Inspector of the Company, proved that he had not received notice of any excavation having been made at the spot in question by Messrs. Mowlem and Co. The life of a good iron pipe was practically everlasting. He had seen one lately taken up which was laid more than thirty years ago; and it was in as good a condition as when first put down. Apart from the fracture, the pipe was perfectly sound. The transverse crack was in the thickest part of the pipe. The longitudinal crack was about 5 or 6 inches in length; and when the pipe was tried under a pressure of gas of 15-10ths, it was found that there was only an escape at one point, and that about the size of a pinhole. In reply to a question by a juror, he said it

would be very difficult to lay the gas-pipe under the culvert; and if so laid, it would be almost impossible to get at it in case of a leak.

In cross-examination, witness was pressed as to the possibility of testing gas-mains by putting in pipes at intervals, which it was suggested was a method referred to with approval by Mr. Livesey at the inquiry before Major Cardew. Witness said it would be possible to test mains in this way, but not practicable; as it would involve every consumer on the portion being tested turning off the gas. He believed the fracture of the pipe was caused by a blow or pressure from above. He adhered to the opinion that, when once a pipe was laid, the less was disturbed the better; and that the information obtained from occasional addition of services and reports of lamplighters and others was sufficient for all practical purposes.

Mr. *Corbet Woodall*, M.Inst.C.E., was next called. He considered 10½ inches a safe depth for a gas-main, in reasonably good ground, though engineers would generally specify for a greater depth. In this case, he thought 10½ inches was the utmost depth possible. He did not believe it was practicable to lay the pipe under the culvert; and if it were, no engineer would recommend it. As Engineer to the London Hydraulic Power Company, which had mains across the bridge, he had procured sections of the bridge, which showed that the total depth from the crown to the iron girders was 3 feet on one side, and 2 ft. 10 in. on the other. The depth of the culvert was more than 18 inches. In his opinion, from the evidence he had heard, the fracture was due to the soil under the pipe having been loosened, and that above it being frozen hard; thus causing any pressure from a heavy passing vehicle to be transmitted to the pipe, which gave way under it. He considered the inspection to which the mains of the Company were subjected in the usual way—viz., by openings for alterations to services, and the continual observation by workmen and lamplighters, who received a reward for reporting any leakage—was ample.

Baron POLLOCK pointed out that no evidence had been given on behalf of the plaintiff as to any precautions which ought to have been taken. To use an old illustration, it could not be suggested that a man ought to take his carriage entirely to pieces every time he was going on a journey, to make sure it was all right. It was for the plaintiff to prove negligence.

In cross-examination witness said nearly all the pipes cast up to about 20 years ago were more or less uneven in thickness. He had not seen the actual pipe which was broken; but he had examined an adjoining length. It was very good metal apparently. It was quite possible to isolate a length of gas-main, and test it for leakage. But all the consumers upon it would have to discontinue the use of gas while the test was being made; and to suggest carrying out such a system all over London, was absurd. The witness was cross-examined at considerable length, but without altering the effect of his evidence in any degree.

Friday, July 31.

On resuming the hearing of the case this morning,

Daniel Standring, foreman fitter, said he found the earth under the injured pipe after the explosion quite wet and soft, so much so that he was able to move it with his hands. The ground above was frozen right down to the pipe, and had to be opened with steel wedges and hammers.

J. R. Martin, lamplighter, gave evidence that he was attending to his duties on the bridge on the day before the explosion; and he then noticed no smell of gas.

Police constable *Sawyer*, who was on duty on the bridge on the day in question, said he observed no smell of gas; and he passed the spot where the explosion occurred about every quarter of an hour.

Cross-examined: He had not received any half-crowns from the Gas Company for reporting escapes of gas. It was his duty to make a report, if there was a smell of gas.

Mr. *Walter Hunter*, M.Inst.C.E., was the next witness. He had examined a portion of the pipe in question, and found that, apart from the longitudinal crack, it was a good and sound pipe. Except for the crack, he should have had no hesitation in using the pipe again, even for water. Pipes were cast more evenly now; but the metal was not quite so good as formerly. He agreed with the evidence which had been given, that it would be very unadvisable to open the ground for the purpose of inspecting gas-mains; it would do more harm than good. In all probability, this accident was caused by the ground having been shifted under the pipe. The only proper way of ascertaining whether there was an escape of gas, was by the smell. There was no reason why a gas-pipe should not last 50 years, or even longer.

Mr. *Frank Livesey*, Chief Engineer to the South Metropolitan Gas Company, said he saw the broken pipe the day after the explosion. The escape of gas came entirely through the transverse crack. He made an experiment to ascertain how much gas would pass through such a crack; and found it was about 240 feet per hour. Apart from the crack, the pipe was serviceable. He tested it severely, both for internal and external pressure. It was laid quite deep enough, if the ground underneath were solid. He knew of no other practical method for finding an escape than the sense of smell. The mains were continually being laid open. In six months, they were opened in more than 7000 places, to make new connections; and in every such case the condition of the main would be observed. He never remembered a case in which a main had been relaid, except to replace it by a larger one—never because it was worn out. It would be quite impracticable to put the main under the culvert.

Cross-examined: The main could not be laid in the culvert.

Baron POLLOCK said such a thing would be utterly illegal.

Cross-examination continued: Sometimes mains were relaid when wood pavement was put down by the local authorities; they might be placed deeper, or laid under the footpath, to avoid interfering with the concrete. Having described in detail the means he took for ascertaining the quantity of gas which would pass through the crack, witness said the plans in possession of the Company showed the position of the mains and pipes, but not what was underneath them. They never, if it could be avoided, interfered with the soil underneath, as it was very important to keep it undisturbed.

Mr. JONES then proceeded to address the jury for the defence; commencing by saying that the Company would very probably make some compensation to the plaintiff, with whom they sympathized, but they were obliged to defend the action as a matter of duty, because it was here sought to impose a responsibility upon gas companies which he contended was never intended by Parliament, and which put upon them an unfair and onerous burden. He submitted to the jury that the whole of the evidence—even that given on behalf of the plaintiff—not only did not prove any case of negligence, but absolutely negatived it.

Mr. THOMPSON having addressed the jury in reply,

Baron POLLOCK summed up the case. He said the plaintiff was seeking to recover damages for an accident caused by what was alleged to be negligent conduct on the part of the defendants. The only two points which arose were pure questions of fact. First, was there such negligence as would entitle the plaintiff to recover; and, secondly, if this was answered in the affirmative, what was the amount of damages to which she was entitled. The second point was one entirely for the jury; and he need only remind them of the circumstances, which had not been put forward in any exaggerated manner. Having done so, he said the real question was one of much greater importance—viz., whether or no there was such negligence on the part of the Gas Company or their servants as would entitle the plaintiff to recover. His duty was simply to tell them what was the character of the negligence required to make the defendants liable; and it was for the jury to say whether the facts in this case brought it within the general principle, or whether this was an accident which occurred without any negligence. It was of great importance that the sort of negligence which made companies of this kind liable should be carefully considered; but it was very difficult to lay down any general rules, because each case must depend upon its own circumstances. Many years ago the question was considered by a very learned judge in a somewhat similar case, where water-pipes had been affected by frost, and he said: "Negligence is the omission to do something which a reasonable man, guided by those considerations which ordinarily regulate the conduct of human affairs! would do, or the doing something which a prudent and reasonable man would not do." This was a sound and clear proposition; but, after all, it did not help them very much, because in each action all the surrounding circumstances had to be considered. In this case, it would be for the jury to say whether the Gas Company had done what they ought to do, in order to protect people from the consequences of any escape of gas. The learned Judge then pointed out that it was not enough even to establish some act of negligence, unless it were also shown to have been the cause of the injury complained of; and that it was the duty of a plaintiff bringing such an action to produce some evidence showing the particular duty which it was alleged had been neglected. It was not enough to say: "I have been injured by an explosion of gas, and therefore there must have been something wrong which you ought to have guarded against." He then went through the evidence briefly as given on each side; and concluded by reminding the jury that they ought not to be guided by highly-strung suggestions as to what might possibly have been done by the defendants, but must consider what was their duty, carrying on their business as practical men, so as to create the least possible danger to the public. If they had done so with reasonable and proper care, the plaintiff was not entitled to recover; but, on the other hand, if they had omitted to do something they ought to have done, or had done something they ought not, they were liable.

Mr JONES suggested that, in the event of ulterior proceedings, it would be well if certain questions which he had written down should be put to the jury.

Baron POLLOCK said he thought it better not. Questions were very often only a snare.

The jury retired to consider their verdict, and were absent three-quarters of an hour. On their return, the foreman said they were all agreed that the plaintiff suffered from the effects of an explosion of gas due to a crack in one of the pipes of the defendant Company; that legal negligence had not been proved against the defendants; but they considered the defendants should compensate the plaintiff for the injury she had sustained, as it arose from a defect existing in the main.

Baron POLLOCK said he could not take the latter part as a verdict. The first part he could; and practically it was a verdict for the defendants. The jury had heard what had been said by the defendants' Counsel, which no doubt would be carried out.

Mr. JONES said it would.

The FOREMAN wished further to recommend that, in the interest of the public, where gas-pipes went over bridges, a periodical examination of them should be made.

COUNTY OF LONDON QUARTER SESSIONS.

Sessions House, Clerkenwell, E.C.—Tuesday, July 28.

(*Before Sir* P. H. EDLIN, Q.C.)

Gas and Water Assessment Appeals.

To-day a sitting of the Court was held for the purpose of taking motions connected with appeals against assessments made at the last quinquennial valuation under the Valuation (Metropolis) Act, 1869.

Mr. MARSHALL (with whom was Mr. AVORY) applied, on behalf of the parish of Greenwich and the Greenwich Union, that the appeals of the South Metropolitan Gas Company against valuation lists of the Union he represented, and also of the unions of Clapham and Wandsworth, Woolwich, and Lewisham, should be heard together. In the case of The Gaslight and Coke Company, at the last quinquennial valuation, this course was taken; and the result was that one examination of each witness sufficed—much time being saved thereby. In the present case, the reasons for adopting this course were even stronger than on the occasion cited.

Mr. SINCLAIR COX, representing the Woolwich Union, Mr. T. T. PAINE, for the Lewisham Union, and Mr. George Elliott, for the Wandsworth and Clapham Union, substantially concurred in the application.

Some conversation took place with Mr. BOSANQUET, Q.C., who, with

Mr. W. C. Ryde, represented the South Metropolitan Gas Company; and eventually it was agreed that all the cases referred to should be put in the list and tried together as far as possible.

Mr. Marshall next made application with regard to the period in respect of which the account should be taken for laying the case before the Court.

The Chairman, however, observed that the cases would probably be tried by his successor; and as this gentleman might take a different view from that which he (Sir Peter Edlin) might hold, he should not make any order in this respect.

It was agreed that the costs of the present motion should be costs in the appeal.

Mr. Boyle, in the appeal of the Grand Junction Water-Works Company against their assessment in respect of mains and pipes in the parish of St. Mary, Paddington, asked for leave to amend the statement of their case by altering certain figures, or, in the alternative, to be allowed to strike out a certain paragraph of that statement. He explained that the figures had been wrongly entered, and that as soon as the error was discovered it was rectified. The alterations he sought to make would increase the total of the assessment by £813.

Mr. Bethune, representing the parish, opposed the motion, on the ground that he had had no notice as to what were the alterations the Company wished to make. He had simply had a notice saying they were going to apply for leave to strike out paragraph 10.

After some further conversation, permission was given to the Company to make the amendment, on the payment of costs, with liberty to the respondents to file such further answer as they might be advised; the amendment to be made within seven days. A similar order was made in respect of motions by the same Company with regard to their appeals against the assessments of their property in St. George's, Hanover Square, St. Mary Abbotts, Kensington, and the parish of Hammersmith.

Wednesday, July 29.

Mr. Jay, who appeared for the New River Company, in their appeal against the assessment of their property in the Hackney Union, which was in to-day's list, applied to have the hearing adjourned for a fortnight. He informed the Court that his side had only had notice the previous afternoon that the case was to be taken that day.

In the course of conversation, it was stated that the appeal involved the valuation of the whole system of the New River Company—a very large question—and that its hearing would occupy a long time. It was eventually agreed, on the suggestion of the Chairman, that the case should not be taken until after September, with notice to parties.

In the case of the East London Water Company, who are appealing against the assessments of their property in the parishes of St. John, Hackney, St. George's-in-the-East, St. Matthew, Bethnal Green, Bromley St. Leonard, Poplar, and St. Mary, Stratford, a similar motion was submitted on behalf of the Hackney Union. The Company not being represented, an order as in the case of the New River Company was made, subject to the consent of the Company being produced to the Clerk of the Court; and, in the event of such consent not being forthcoming, further application was to be made.

Upon the conclusion of the other business of the Court, the Bench retired for a few minutes. On returning,

The Chairman made a statement as to the course the Court would take with regard to the appeal yet to be heard. Among the cases were the following, which they had decided not to take until after the end of September: The appeals of the Wandsworth and Putney Gas Company, the Chelsea Water Company, the New River Company, the South Metropolitan Gas Company, and the East London, Grand Junction, West Middlesex, and Southwark and Vauxhall Water Companies.

Gas Consumption through Prepayment Meters.

At the Todmorden Petty Sessions on the 23rd ult., a number of gas consumers were summoned for default in payment. Among them was a lady who disputed a claim for 1s. 4d. for gas supplied through an automatic prepayment meter. The defendant pleaded that the fact that only four pennies were found in the receptacle when the inspector called to take the registration of the meter ought of itself to be accepted as demonstrating that she had not consumed more than four pennyworth of gas; and at least one Magistrate avowed himself of this way of thinking. For a while the collector (Mr. Scholfield) vainly strove to show that the ordinary index affixed to the meter having registered gas to the value of 1s. 6d., and their official having found only 4d. in the meter, the District Council, the suppliers of the gas, were entitled to claim the balance. Mr. D. Sutcliffe, the Clerk to the Council, endeavoured to satisfy the Bench that the Council were warranted in charging for the gas registered—nay, more, that parties were bound by the index, not only because a card was furnished expressly stipulating that whatever sum was found in the machine must be adjusted either way by comparison with the dial, but by the law, which, as he insisted, recognized this method alone. Nevertheless, their Worships decided to dismiss the case. Of course, they doubtless had good reasons for so doing; but they do not immediately strike one. It was urged by the defendant that there was leakage somewhere; but, of course, the Council were not responsible for faulty fittings inside the house. Consequently, there must have been some side issue to account for what certainly appears to have been an extraordinary finding. The registration of the index is *primâ facie* evidence of consumption; and administrators of the law are bound by it.

Exemplary Fine for Stealing Water.

At the Oldbury Police Court last week, James Lines, landlord of the Nag's Head Inn, Oldbury, and his brewer, Richard Henry George, were charged with unlawfully permitting a pipe to be affixed to a service-pipe of the South Staffordshire Water-Works Company. Dr. Showell Rogers, who prosecuted, said that Lines occupied premises in Flash Road, and adjoining these there was a house occupied by a man named Walker; the two places being separated by an entry. Up this entry a service-pipe ran; and the water was conveyed from that into the defendant's brewhouse by another pipe. This service-pipe also supplied a "Lincoln pillar" upon the premises of Walker. Up to last year, Lines was supplied with water at 15s. per quarter; but, in consequence of certain information, the supply was discontinued. A meter was fixed to the service-pipe on Feb. 13 last, so that the whole of the water which was legitimately used should have passed through it. On the 11th inst. an inspector detected a hose-pipe connected from the Lincoln pillar to the premises of the Nag's Head Inn. For the defence, Mr. Clark called witnesses to prove that Lines instructed no one to use the water from the Lincoln pillar. The Bench fined Lines £3 12s., including costs, and George 9s. 6d.

Contractors' Liability for Damage to Gas-Pipes by Sewerage Works.

At the Cambridge County Court on April 29 last, Mrs. E. A. Lucas sued the Corporation for compensation for personal injuries and damage to furniture caused by an explosion of gas which took place in the previous December. The case was reported in the "Journal" for May 12 last (p. 1043). It may be remembered that the explosion was the outcome of some sewerage works which were being carried out by the Corporation; and that the plaintiff obtained judgment for £43 and costs on the higher scale—in all £80 16s. The question then arose as to whether the Corporation or their contractor, Mr. J. Nuttall, ought to be made liable for payment. The matter was argued in Cambridge before his Honour Judge Bagshawe, Q.C., on the 22nd ult., when Mr. Fletcher Moulton, Q.C., and Dr. Cooper appeared for the Corporation; Dr. Pankhurst representing Mr. Nuttall. It was held by his Honour, at the original hearing, that the gas-pipe was not properly supported; and it was now contended, on behalf of the contractor, that he was prevented from so supporting it by the orders of the Corporation's officials. Mr. Moulton pointed out that one clause of the specification emphasized the duty of the contractor to support gas-pipes; and another gave the Engineer of the Corporation powers of arbitration. Dr. Pankhurst said the damage was caused by the direct interference of the Engineer, who ordered the removal of certain timber shoring in the street in which the explosion occurred. His Honour pointed out that the contractor was not bound to take out the timber because he was told to do so. It might be urged that, with or without the timber, the contractor was under obligation to support the pipe. Mr. Moulton said that was his point; and, moreover, he denied that an order was given to take out the timber. Dr. Pankhurst said that, after the shoring was removed, they did all that was humanly possible to support the pipe without it. Evidence having been given, the arguments were postponed till Monday last week, when his Honour heard them at his chambers in London. Dr. Pankhurst dealt at considerable length with the question as to who was responsible for the timber being taken out. He complained that, after the accident, Mr. Nuttall urged that the matter should be compromised. But the Corporation took no steps in the matter; and he thought they were bound to do so. He concluded by submitting that no liability had been proved against his client. His Honour said, if the contractor had paid the money claimed, there would have been an end to the action; and perhaps this would have been the wisest thing he could have done. He gave judgment against Mr. Nuttall for indemnity, such indemnity to include (1) the damages recovered in the action; (2) Mrs. Lucas's taxed costs; (3) the costs of the present proceedings on both days, to be taxed; and (4) the costs properly incurred by the Corporation in defending the action. His Honour added that he could not but think it would have been better if the timber had been left in at the expense of the Corporation. Dr. Pankhurst asked for a stay of execution, to allow of an appeal. His Honour agreed to grant this until the 10th prox.; and if an appeal was entered on or before that day, a further stay till the hearing of the appeal or a further order.

South Staffordshire Water-Works Company.—At the meeting of the Directors of this Company last Thursday, it was resolved (subject to the examination of the accounts by the Auditors) to recommend the declaration of a dividend for the half year ended June 30 last on the ordinary stock at the rate of 5¾ per cent. per annum, less income-tax; carrying forward a balance of £4247 to the credit of next half year.

Fire at Messrs. W. Sugg and Co.'s.—A fire broke out early last Saturday morning on the premises of Messrs. W. Sugg and Co, Regency Street, Westminster. It was announced in an evening newspaper as a "big Westminster blaze;" but, as a matter of fact, as will be seen by an advertisement which appears in another part of the "Journal," it was confined to the tinplate workers' shop, and will not interfere with the execution of orders.

Calverley and Horsforth District Gas Company.—The half-yearly report of this Company states that the income for the past six months was £4100; and the expenditure, £2613—leaving a balance of £1487. After deducting the half-year's interest on loans, a balance of £1439 is left, which, with £67 taken from the profit and loss account, makes the sum required for the statutory dividends. The Directors add that the bad state of the woollen trade of the district and the very serious reduction in the price of ammoniacal liquor have materially affected the revenue.

Increased Storage at the Todmorden Gas-Works.—A new gas-holder has just been completed at the Millwood works of the Todmorden District Council, by Messrs. C. and W. Walker, of Donnington, Shropshire; and it was inaugurated a few days ago by the Chairman of the Gas Committee (Mr. Sugden Sutcliffe, F.R.G.S.), in the presence of a numerous company. The erection of the holder was superintended by the late Manager (Mr. G. E. Saville), who has been succeeded by Mr. H. Hawkins. It will contain 750,000 cubic feet of gas, as compared with 250,000 cubic feet, the capacity of the two original holders. The make of gas is at present about 120 millions per annum; but, with the improvements now in progress in the retort-house, it will be 150 millions in the future. These with the new holder will cost about £20,000. The gas was turned on by Mr. Sutcliffe, who expressed the hope that the holder would meet the present requirements of the town.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Report and Accounts.

The following report, with the accounts showing the working of the Company during the six months ending June 30 last (given on p. 228), will be submitted to the proprietors at the half-yearly general meeting next Friday:—

The accounts for the past half year show that, after providing for all fixed charges, there remains a balance of £474,710 16s. 3d., out of which the Directors recommend a dividend at the statutory rate of 12¾ per cent. per annum; carrying forward to the credit of the current half year the sum of £108,897 14s. 11d.

The quantity of gas sold during the half year has been 9,852,694,000 cubic feet, or 11,782,000 more than the quantity sold in the June half of 1895, when, owing to the severe frost of January and February, there was an unusually large increase in the demand for gas. The figures of gas sold for the past half year, after correction for the extra day (the 29th of February), when compared with those for the June half year of 1894, show the very satisfactory increase of 563,569,000, which is equal to an average rate of 3 per cent. per annum for the two years.

The constantly increasing use of gas for cooking and heating, and the extension of the system of supply of gas by automatic prepayment meters (of which 42,333 are now fixed on this Company's district), have largely contributed to the improvement in the Company's business.

The unsatisfactory item in the revenue for the half year is that of coke; the income from this source having been £60,577 os. 3d. less than in the corresponding half of 1895. The Directors, however, in view of what appears to be a temporary excess of production of coke over the requirements of its users in this country, have entered into advantageous contracts for its export on a much larger scale than at any former period.

The Directors have the satisfaction to report that their purchases of coal for the current twelve months have been made at prices slightly lower than those of last year's contracts.

In order to provide for the expenditure necessary for an extension of automatic meter supplies and the general increased demand for gas, the Directors will apply to the proprietors for authority to create and issue ordinary "A" stock to the further amount of £150,000.

The Engineers of the several manufacturing and distributing departments have certified to the Court of Directors that all the plant of the Company under their charge respectively has been maintained in full efficiency during the past half year.

Following the report is the statement of accounts. As usual, we merely indicate the alterations that have taken place in those portions which are not subject to much variation, giving the rest in full.

Nos. 1 and 2 are the statements of stock, share, and loan capital, the totals of which on June 30 last were as follows: Stock and share capital, £8,854,000; loan capital, £2,444,000. The former amount is £100,000 more than on Dec. 31, 1895. The total amount of existing share capital powers is £9,204,000, and of borrowing powers £2,669,000; so that there is a sum of £350,000 unissued share capital, and £225,000 remains to be raised on loan.

No. 3 is the capital account, the receipts on which (with premiums, £1,163,850) stand at £12,461,850. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1895			£11,792,851 9 11
Expenditure during the half year to June 30, 1896, viz.:—			
Lands acquired, including law charges	£36 3 11		
Buildings and machinery in extension of works	33,228 15 4		
New and additional mains and service-pipes	24,990 3 3		
Do. do. meters	45,096 6 1		
Do. do. stoves	14,518 5 2		
	£117,869 13 8		
		£11,910,721 3 7	
Balance of capital account		551,128 16 5	
		£12,461,850 0 0	

Nos. 4 and 5 are the revenue and net revenue accounts. These are given in full on p. 228.

No. 6 is a statement showing how the Directors propose to appropriate the balance applicable for dividend. It is as follows:—

June, 1895.			
£255,255 ..	Net balance brought from last account	£164,121 2 5	
361,516 ..	Net revenue for the half year	310,589 13 10	
£616,771		£474,710 16 3	
(12¾ per cent.)	A dividend on the ordinary stock—		
£359,970 ..	12¾ per cent. per annum on £5,746,590	365,813 1 4	
£256,801 ..	Balance carried to next account	£108,897 14 11	

Nos. 7, 8, and 9 are the reserve and insurance fund and depreciation accounts. The first shows that the balance on Dec. 31 last was £129,009, which was increased to £130,683 on June 30 by the addition of £1674, interest on the sum invested. The insurance fund stood at £85,180 on Dec. 31, and on June 30 at £86,226. The interest amounted to £1105; but plant to the value of £59 was destroyed by fire in the six months covered by the accounts. The depreciation fund amounted to £44,593 on Dec. 31, and to £45,262 on June 30.

Nos. 10 and 11 are as follows, and Nos. 12 and 13 are given on p. 228.

No. 10.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, 31st Dec., 1895.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 30th June, 1896.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	267,287	873,579	994,962	2,170	143,734
Cannel	14,477	20,771	*22,379	—	12,869
Total	281,764	894,350	*1,017,341	2,170	156,603

* In addition to this quantity, oil and spirit, the equivalent of 22,923 tons of cannel have been used during the half year.

No. 11.—STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 31st Dec., 1895.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store 30th June 1896.
Coke—tons	136,198	629,614	129,070	435,286	201,456
Breeze—tons	5,778	67,737	31,828	39,914	1,773
Tar—gallons	820,365	10,430,172	10,593,041	15,273	642,223
Ammoniacal liquor—butts	21,203	289,519	279,907	13,167	17,648

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of the above Company for the six months ending June 30 last:—

A very mild winter has followed a very severe one. In the June half of 1895, there was an increase of 13 per cent. in the consumption of gas. This half year it is only at the rate of 2 per cent. This gives a good average for the two years.

The additional business is mainly due to the demand for gas by weekly tenants who, in consequence of the introduction of the automatic or "penny-in-the-slot" meters, have largely adopted the use of gas. The number of these meters fixed in the half year is 7142, which brings up the total in less than four years, to June 30 last, to 50,091; 37,408 small cooking-stoves have also been supplied to these consumers. The increase of ordinary consumers and cooking-stoves is at about the usual rate. The numbers of all meters and stoves in use are given every half year in the accounts.

The general result of the working of the half year is not, however, so satisfactory as might perhaps be expected from the tenor of the opening paragraphs of this report. The receipts for products have fallen off to the extent of £23,747; and the reduction of 1d. per 1000 cubic feet that was made in the price of gas from Midsummer, 1895, reduces the profit on the half year by some £16,000. The general result, however, is an amount of profit sufficient to meet all charges for interest, to pay the usual dividend, and to leave a small surplus.

The Directors recommend the payment of a dividend at the nominal rate of 13 per cent., to be apportioned, for the last time, in accordance with the Scheme of Amalgamation. They also recommend that the surplus of £3090 14s. 6d., with £5121 15s. 6d. taken from the undivided balance—together equal to the odd ¾ per cent. of dividend, which under the sliding-scale might be paid—be added to the reserve fund. There will then remain £13,540 3s. 1d. to be carried forward to the next account; and the reserve fund will amount to £92,259.

The profit-sharing system continues to work satisfactorily both in the development of a spirit of goodwill towards, and interest in the welfare of, the Company on the part of a large proportion of the employees of all ranks, and in promoting thrift. The amount now invested by the employees in the Company's stock, under the operation of the system, is £35,309, and they have also on deposit in the Company's hands the further sum of £37,225.

The Directors have at last the satisfaction to report the passing of the Bill for the conversion of the Company's three classes of stock into one uniform 4 per cent. sliding-scale stock on the terms agreed at the Wharncliffe meeting of the proprietors in February last. The Act fixes the 12th inst. for the conversion; consequently, from that day all division of interests amongst the stockholders will cease. As soon as possible, new certificates will be issued; but this will depend upon the celerity with which the shareholders buy or sell the small fractions of stock necessary to bring the converted stock to amounts of £5, or multiples thereof, as provided by the Act. A circular containing full information will be issued at once; and every facility will be given by the Company for the transfer of the fractions of stock, in order that the new certificates may be in the possession of the proprietors with as little delay as possible.

On and after Aug. 12, 1896, the "A," "B," and "C" stocks are abolished, and all transfers must be made in the new or converted stock, which is a 4 per cent. stock, subject, under the sliding-scale, to an increase or diminution of 2s. per cent. of dividend for every variation of 1d. in the price of gas. The exact equivalent of a 13 per cent. dividend on the old 10 per cent. stock is £5 4s. per cent. on the new 4 per cent. stock. The terms of conversion are as follows:—£100 of "A" stock becomes £299 of the new stock, or £14 19s. for each £5; £100 of "B" stock becomes £232 10s. of the new stock, or £11 12s. 6d. for each £5; and £100 of "C" stock becomes £250 of the new stock, or £12 10s. for each £5.

Following the report are the usual statements of account.

Statements Nos. 1 and 2 show the amount of share and loan capital raised at the close of the past half year. The former stood at £2,190,000; the latter at £820,000. The share capital has been increased by the issue of £30,000 of "C" stock since Dec. 31; the loan capital, by the raising of £20,000 of 5 per cent. debenture stock.

Statements Nos. 3, 4, and 5 are given in full on p. 229.

Statements Nos. 6, 7, and 8 show that the reserve fund stood at £84,047 on June 30 last, as compared with £74,464 on Dec. 31, 1895; the renewal fund at £15,216, and the insurance fund at £43,134, as compared with £14,869 and £42,464.

Statements Nos. 9 to 11—furnishing particulars as to the manufacturing operations of the Company—and No. 12, the general balance-sheet, are given in full.

BRENTFORD GAS COMPANY.

The Half-Yearly Report and Accounts.

The statement of accounts of the above-named Company for the six months ending June 30 last, which will be presented to the proprietors next Friday, shows a sum of £60,122 available for division; and, as mentioned in the "JOURNAL" last week, the Directors will recommend dividends at the rates of 5, 12, and 9 per cent. on the three classes of stock. In their report they state that, notwithstanding the mildness of the season in the early part of the present year, as compared with that of 1895, the sale of gas during the half year shows an increase of 1·64 per cent. over the corresponding period of last year, and of 12·44 per cent. over the corresponding period of 1894. There is still great depression in the markets for residual products, which has caused this department of the Company's business to compare unfavourably with the corresponding six months of 1895; coke alone showing diminished receipts to the extent of £5120. The Directors also regret the additional charge for the half year, amounting to about £3000, on account of rates and taxes. The reconstruction of No. 2 gasholder at the Brentford station, referred to in the last report, is going on satisfactorily, and will be completed for the ensuing winter. With a view to the further development of the Company's business in gas-stoves for heating and cooking purposes, the Directors have opened premises as show-rooms, in the High Road, Chiswick. They have also show-rooms in Ealing and in Brentford. The applications for a supply of the Company's gas by the automatic meter system continue most satisfactory; the number of consumers up to the 30th of June last being 6675—showing an increase of nearly 100 per cent. over the number for the corresponding period of 1895.

Referring to the accounts, the sum of £14,148 was spent in the past half year on new buildings and machinery, additional mains, services, meters, and stoves; bringing the total capital expenditure up to £885,585, out of £887,020 called up—leaving the small balance of £1434. The sum received for gas was £95,246, as compared with £93,679 in the June half of 1895; for meter and stove rentals, £6012, against £4908; for residual products, £20,401, against £26,464—the total receipts being £121,732, as compared with £125,139. On the expenditure side of the revenue account are the following items: Manufacture of gas (coals costing £42,486), £64,777, as compared with £66,742; distribution, £10,761, against £9062; public lamps, £1902, against £1899; rents, rates, and taxes, £8481, against £5445; and management, £4393, against £4264. Miscellaneous items bring the total expenditure up to £91,581, as compared with £88,383; the balance being £30,151, against £36,756. The drop of about £6000 in residuals is to an extent compensated for by an increase of about £2600 in the gas and meter rentals. With regard to manufacturing operations, the quantity of coal and cannel carbonized was 66,742 tons, as compared with 66,532 tons in the corresponding half of 1895. The bulk of gas made was 686,224,000 cubic feet, against 681,937,000 cubic feet before. The estimated quantities of residuals were: Coke, 44,508 tons; breeze, 5548 tons; tar, 676,274 tons; ammoniacal liquor, 19,890 butts of 108 gallons (inclusive of 387 butts purchased).

DEVONPORT GAS COMPANY.

The Fifty-Second Annual General Meeting of this Company was held on Friday, the 24th ult.—Mr. R. CLARKSON SMITH in the chair.

The SECRETARY (Mr. J. Williams) having read the notice convening the meeting, the report of the Directors was presented. In the course thereof, they stated that the total amount received for gas and residuals in the past financial year was £28,715, as compared with £29,009 in the preceding twelve months. The decline was due to the continuous fall in the value of sulphate of ammonia. The balance of profit and loss—£5877—was carried to the net revenue account. After payment of the dividends authorized at the last annual general meeting, there was an available balance of £10,443, out of which the Directors recommended the payment of the statutory dividends of 10 per cent. on the original, and 6 per cent. on the guaranteed shares, free of income-tax; carrying forward the balance. Having regard to the satisfactory state of the balance-sheet, they proposed making a further reduction in the price of gas, commencing at the termination of the current quarter, from and after which the charge would be 2s. 6d. per 1000 cubic feet.

The CHAIRMAN, in moving the adoption of the report, remarked that, though the Company's progress had been somewhat slow, as compared with larger concerns, the Directors had a fair balance-sheet to present to the proprietors. Their Manager (Mr. R. Clark) had been actively engaged throughout the year in reconstructing and remodelling the plant upon the works, and in laying mains in the roads which were being planned in the northern part of the borough. This had entailed considerable outlay in districts where the supply of gas was not likely to be extensive, and where for the present it was all outlay with very little or no return. Increased expenditure on some items had been met by increased economy on others; so that really the expenses had been slightly less than in the preceding year. The total expenditure for coal carbonized, wages, repairs, renewals, rates, taxes, and other incidental expenses, inclusive of £1500 carried to the account for depreciation of plant and works, was £22,843; being a decrease of £130 as compared with last year. The balance carried to the net revenue account was £5877, which, though somewhat less than last year, was highly satisfactory.

Mr. RAE seconded the motion.

Mr. GILL asked whether the Directors had in view the introduction of the incandescent gas-light.

The CHAIRMAN replied that they had made an offer to the Lighting Committee of the Corporation, which was still under consideration. They had undertaken to supply the lamps in Fore Street at an extra cost of 5s. per lamp per annum, which was very liberal, as the maintenance of the lamps would come to at least 10s. or 12s. per lamp per annum.

The report was adopted; and the dividends recommended were declared.

STOKE-UPON-TRENT CORPORATION GAS SUPPLY.

A Satisfactory Report.

The Executive Gas Committee of the Stoke Corporation have submitted the following report upon their accounts for the year to March 31 last: "The profit and loss account discloses the fact that when the expenditure (£1271) upon the new roof to the retort-house and extensions to the purifying plant is taken into account, the net profit is £4096. This sum has never been exceeded while the selling price of gas has been 3s. per 1000 cubic feet, and only once when it was 3s. 6d. The average annual net profit, with gas at the former price, has been £2943. The expenditure referred to has been charged against revenue; and, as far as possible, the further additions and alterations now in progress and those contemplated will be similarly dealt with, as the Committee are strongly of opinion that fair and reasonable expenditure could not have been made in the past upon the works and plant, and particularly in view of the fact that a sum of £2700 was borrowed and expended upon a patent oxygen process, which, after a fair trial, proved to be an absolute failure, and was, with the consent and approval of the Council, abandoned and demolished. The amount therefore owing by the Corporation in respect of the gas-works includes this sum of £2700, for which the only asset is some machinery worth a nominal sum. Notwithstanding the expenditure upon the additions and alterations, the Committee remitted to the Corporation in reduction of rates the sum of £2890, as compared with £2708—the average for the years 1886-1895. The Committee have also added substantial amounts annually to the reserve fund, which now stands at £5097, as compared with £2853 at the end of 1892. Of the fund, £2000 is invested with the Corporation at 4 per cent. per annum; and the balance is in cash at the bankers. During the year, 171 prepayment meters were fixed; making in all 298 in use in the borough on March 31 last. The Committee hope this number may be considerably increased, as they are fully satisfied that no more convenient method can be adopted by ratepayers desirous of paying for their gas as it is consumed. The alterations and additions already referred to will, in the opinion of the Committee, suffice to make the supply equal to all demands that may be made for gas for many years to come; and they are so planned and arranged as to admit of easy extension."

GAS AND ELECTRICITY AFFAIRS AT LEICESTER.

Half-Yearly Report—Hours and Wages at the Works.

At the Meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee reported that during the six months ended June 30 last, 62,098 tons of coal had been carbonized. The quantity of gas made was 631,613,000 cubic feet, as against 597,894,000 cubic feet in the corresponding period of the previous year; being an increase of 33,719,000 cubic feet, or 5·63 per cent. The Committee also stated that they had decided to extend the mains to the village of Ratby. The estimated annual consumption of gas was 1,300,000 cubic feet; and the cost of the work would be about £800. Alderman Lennard moved the adoption of the report. He remarked that they had had a satisfactory half year. In three directions, they had been successful in finding an extra outlet for their mains. Of gas-engines alone, they had 555, an increase of 46; of gas-stoves, 8082, an increase of 1007; and prepayment meters 1257, of which 663 had been supplied this last half year. The motion was carried.

With regard to electric lighting, it was reported that the total output of current for the half year had been 90,786 units, as against 29,778 units in the corresponding period of last year; being an increase of 61,008 units. The number of consumers was 211.

The Committee subsequently reported that they had made arrangements whereby only under exceptional circumstances will any man be employed more than six days per week. Alderman Lennard, in moving the adoption of this report, remarked that the ordinary working hours were 54 per week; but, as to those who worked in eight-hour shifts, they had decided no man should work more than six shifts per week, which would be 48 hours. The rates of pay were increased from 5s. to 5s. 5d. per shift; making 32s. 6d. per week, instead of 35s. per week for seven days, so that the men obtained an advance of wages in proportion and a reduction of hours, and the increased cost would be from about £1300 to £1400 per year. Mr. Billings seconded the motion, which was agreed to.

Gas and Water Finances at Brighouse.—At the last meeting of the Brighouse Town Council, the Chairmen of the Gas and Water Committees generally informed their colleagues as to the results of the working of their respective departments during the past financial year. Alderman Sugden stated that the figures of the Gas Committee referred to twelve months' working of the Brighouse works, and nine months in the case of the Rastrick works. They had made the handsome profit of £3145; and it had been decided to increase the discount from 20 to 25 per cent., which represented a reduction of 2d. per 1000 cubic feet in the price of gas. It was pointed out by Mr. Clay that the sum mentioned as profit was not in cash; for out of it the cost of the public lighting was defrayed. On behalf of the Water Committee, Alderman Stocks had not such a pleasing statement to lay before his colleagues. He had to report a deficiency of £417 on the year. The Committee, however, expected there would be a fairly large loss this year on account of the way in which, at the incorporation, the price of water in Rastrick was reduced for domestic consumption, and the charge for water-closets was abolished. The water cost the Corporation rather more than 8d. per 1000 gallons (including the charges for management, &c.). The average consumption was about 12 gallons per head, which meant approximately 19,710 gallons per annum for each dwelling-house in the borough. Taking 3633 houses at under £9 rental, he found that they should be charged a sum of £2270, instead of which they only paid £1449. The Committee were considering how to meet a portion of this deficiency. The reports were adopted.

ACCOUNTS OF THE GASLIGHT AND COKE COMPANY FOR THE HALF YEAR ENDING JUNE 30, 1896.

No. 4.—REVENUE ACCOUNT.

Dr. Cr.

June Half Year, 1895.	To Manufacture of gas—	£ s. d.	£ s. d.	June Half Year, 1895.	By Sale of gas—	£ s. d.	£ s. d.
	Coals, including oil, dues, carriage, unloading and trimming (see			£1,312,948	Common gas, per meter, at 2s. 10d. and 2s. 3d. per 1000 cubic feet .	1,312,419 0 6	
£624,366	Account No. 10)	573,399 16 4			Public lighting and under contracts—		
	Salaries of Engineers and other			74,128	Common gas	74,948 15 9	
13,004	Officers at works	13,492 16 2			(See Statement No. 12.)		1,387,367 16 3
159,537	Wages (carbonizing) £161,245/10/6	177,015 11 10		£1,387,076			
15,966	Sundries . . £15,770/1/4						
	Purification, including £15,860/17/9			£10,168	Rental of stoves	..	11,633 1 1
32,891	for labour	36,733 8 3			Residual products—		
	Repair and maintenance of works and plant, materials and labour,			£234,892	Coke, less £43,533 8s. 2d. for labour, &c.	208,814 16 4	
141,882	less received for old materials, £2320 0s. 2d.	145,142 18 0		5,279	Breeze, less £2218 3s. 0d. for ditto.	3,787 2 10	
				84,209	Tar and tar products	87,280 19 1	
			945,784 10 7		Ammoniacal liquor and sulphate		
	Distribution of gas—			66,839	of ammonia	63,859 2 6	
	Salaries and wages of Officers						
26,063	(including Rental Clerks) . .	28,464 18 9		£420,719			353,742 0 9
	Repair and maintenance of mains						
40,728	and service-pipes	50,311 10 7		£4,032	Rents receivable		3,988 18 9
22,578	Repair and renewals of meters .	23,085 16 5		255	Transfer fees		257 9 0
25,821	Stove fixing, repairs, and renewals	22,067 18 3					
	Public lamps—		123,930 4 0				
16,711	Lighting and repairing	..	17,104 0 2				
	Rents, rates, and taxes—						
4,297	Rents payable	4,772 19 7					
100,457	Rates and taxes	108,213 4 10					
	Management—		112,986 4 5				
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors	200 0 0					
	Salaries of Secretary, Accountant,						
8,128	and Clerks	8,759 0 4					
15,220	Collectors' commission	17,753 7 4					
5,905	Stationery and printing	6,470 0 4					
1,905	General charges	2,754 6 8					
			88,686 14 8				
32	Parliamentary charges	..	201 19 6				
1,224	Law charges	..	2,191 8 9				
7,984	Bad debts	..	5,982 17 10				
10,730	Annuities	..	12,766 18 10				
	Public Officers—						
1,187	Gas Referees and Official Auditor.	881 14 6					
1,807	Public testing-stations	925 10 0					
			1,810 4 6				
£1,273,863			1,261,445 3 3				
548,887	Balance carried to net revenue account, No. 5 .		500,544 2 7				
£1,822,250			1,761,989 5 10	£1,822,250			1,761,989 5 10

No. 5.—NET REVENUE ACCOUNT.

Dr. Cr.

June Half Year, 1895.		£ s. d.	£ s. d.	June Half Year, 1895.		£ s. d.	£ s. d.
£62,660	To Interest on debenture stocks and bonds, accrued to June 30, 1896 . .	..	62,659 12 6	£594,050	By Balance from last account	524,091 4 8	
74,015	Dividend on the preference stocks . .	74,015 5 0		338,795	Less dividend on the ordinary capital for the half year to Dec. 31, 1895 . .	359,970 2 3	
47,500	Dividend on the maximum stocks . .	47,500 0 0					164,121 2 5
			121,515 5 0	£255,255			
3,196	Interest on temporary loans and sundry funds . . .		5,779 11 3	548,887	Revenue account (No. 4)	..	500,544 2 7
616,771	Balance applicable to dividend on the ordinary stock .		474,710 16 3				
£804,142			664,665 5 0	£804,142			664,665 5 0

No. 12.—STATEMENT OF GAS MADE, SOLD, Etc.

Description of Gas.	Quantity Made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights and under Contracts (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	*10,521,839	520,788	9,331,906	9,852,694	139,946	9,992,640	529,199	51,970
June half year, 1895 .	10,526,625	514,227	9,326,685	9,840,912	129,346	9,970,258	556,367	51,706

* Including 355,101 Thousands of "oil gas."

No. 13.—GENERAL BALANCE-SHEET.

Dr. Cr.

June Half Year 1895.		£ s. d.	£ s. d.	June Half Year 1895.		£ s. d.	£ s. d.
£	To Capital—			£			
520,644	Balance at credit thereof	..	551,128 16 5	164,233	By Cash at Bankers.	..	87,850 17 11
	Net Revenue—			275,000	Amount on deposit at interest . . .		
616,771	Balance at credit thereof	..	474,710 16 3		Amount invested—		
	Reserve Fund—				2¾ per Ct. Consolidated Stock . . £209,093 19 3	..	211,129 17 11
127,344	Balance at credit thereof	130,683 7 7		211,130			
	Insurance Fund—				Stores on hand, viz.—		
85,047	Balance at credit thereof	86,226 8 1		95,631	Coals	91,776 8 8	
212,391			216,909 15 8	45,296	Coke	78,810 12 3	
				204,314	Tar and ammoniacal liquor and products	249,278 6 0	
	Depreciation Fund—			214,152	Sundry stores	230,779 15 6	
43,934	Balance at credit thereof	..	45,262 0 0				650,645 2 5
	Interest on debenture stocks and bonds,				Accounts due to the Company, viz.—		
62,660	due on June 30, 1896	..	62,659 12 6		Gas and stove rental—		
	Preference and maximum dividends			521,262	Quarter ending June 30, 1896 . .	552,860 11 5	
121,515	due on June 30, 1896	..	121,515 5 0	20,170	Arrears outstanding	16,573 5 4	
	Unclaimed dividends due on June 30,						569,433 16 9
8,004	1896	..	8,003 18 9	30,697	Coke and other residual products .	30,833 6 7	
	Sundry tradesmen and others, for			1,280	Sundry accounts	10,727 0 2	
	amount due for coals, stores, and						
241,990	sundries.	..	276,470 0 0				1,565 6 9
1,667	Benevolent Fund	..	1,667 6 8	46,461	Automatic meter supplies (fittings account)	..	197,702 9 6
1,829,576			1,758,327 11 3	1,829,576			1,758,327 11 3

ACCOUNTS OF THE SOUTH METROPOLITAN GAS COMPANY FOR THE HALF YEAR ENDED JUNE 30, 1896.

No. 3.—CAPITAL ACCOUNT.

Dr. Cr.

To	£ s. d.	£ s. d.
Expenditure to Dec. 31, 1895	..	3,105,715 4 0
Expenditure during half year to June 30, 1896, viz.—		
New buildings and machinery in extension of works	1,898 8 10	
New and additional mains and services	19,146 19 1	
Do. meters	18,489 15 9	
Do. stoves	22,886 16 0	
		62,421 19 8
Total expenditure	..	3,168,137 3 8
Balance	..	156,311 16 4
		3,324,449 0 0

By	Certified to Dec. 31, 1895.	Received since that Date.	Total to June 30, 1896.
	£ s. d.	£ s. d.	£ s. d.
A stock	500,000 0 0	..	500,000 0 0
B stock	1,350,000 0 0	..	1,350,000 0 0
C stock	310,000 0 0	30,000 0 0	340,000 0 0
Debenture stock, 5 per cent.	800,000 0 0	20,000 0 0	820,000 0 0
	2,960,000 0 0	50,000 0 0	3,010,000 0 0
Premium capital	538,785 6 0	80,663 14 0	614,449 0 0
	3,498,785 6 0	130,663 14 0	
			3,624,449 0 0

No. 4.—REVENUE ACCOUNT.

To	£ s. d.	£ s. d.
Manufacture of gas—		
Coals into store, including cost of petroleum spirit for enriching (see Account No. 9)	£206,584 13 6	
Purification, including £5291 12s. 10d. for labour	9,164 17 7	
Salaries of Engineer and Officers at works	6,431 8 0	
Wages (carbonizing)	49,356 11 8	
Repairs and maintenance of works and plant, including £35,570 0s. 2d. for labour, less £1558 18s. 2d. received for old materials	67,279 5 2	
		£338,816 15 11
Profit sharing for 12 months to June 30, 1896	£17,417 6 1	
Less on account Dec. 31, 1895	7,000 0 0	
		10,417 6 1
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes (labour, £11,723 11s. 6d.)	£17,714 4 0	
Salaries, &c., Officers and Rental Clerks	10,978 12 5	
Repair, &c., of meters (£1045 7s. 11d. for labour)	6,345 19 0	
Repair, &c., of stoves (£2672 13s. 6d. for labour)	6,228 3 9	
Gas fittings (labour)	3,563 4 1	
		44,830 3 3
Public lamps—lighting and repairing, including £5322 9s. 9d. for labour		5,856 1 8
Rents, rates, and taxes—		
Rents payable	£1,478 18 2	
Rates and Taxes	27,872 1 10	
		29,351 0 0
Management—		
Directors' allowance	£1,750 0 0	
Salaries of Secretary, Accountant, and Clerks	2,151 6 10	
Collectors	7,568 18 3	
Stationery and printing	1,516 2 4	
General charges	3,621 15 3	
Company's Auditors	112 10 0	
		16,722 12 7
Law charges		1,085 18 11
Parliamentary charges		369 4 0
Bad debts		1,193 7 2
Pensions and officers' and men's superannuation and sick funds		3,711 11 8
Gas Referees and Official Auditor		293 6 7
Total expenditure		£452,597 7 10
Balance carried to net revenue account (No. 5)		167,407 17 1
		£620,005 4 11

By	£ s. d.	£ s. d.
Sale of gas—		
Lady Day, at 2s. 3d. per 1000 feet	£262,439 14 0	
Midsummer, at 2s. 3d. per 1000 feet	156,557 16 11	
	£418,997 10 11	
Public lighting and under contracts (see Statement No. 11)	31,329 7 11	
		£450,326 18 10
Meters in use, 141,321—		
Company's meters at rent: Ordinary, 81,050; automatic, 50,091	£13,770 12 0	
Stoves at rent: Ordinary, 31,195; auto., 37,408	10,857 19 7	
		24,628 11 7
Residual products—		
Coke, less £13,816 8s. 5d. for labour, &c.	£93,115 10 6	
Breeze, less £2463 19s. for labour, &c.	2,895 11 4	
Tar, less £344 8s. 8d. for labour, &c.	26,815 11 3	
Ammoniacal liquor, less £206 6s. 9d. for labour, &c.	11,311 10 9	
Sulphate of ammonia, less £801 11s. 3d. for labour; £2917 4s. 5d. for acid, &c.	9,341 5 6	
		143,449 9 4
Rents receivable		1,541 5
Transfer fees		59 0
Total receipts		£620,005 4 11

No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

	£ s. d.	£ s. d.
Interest on temporary loan and deposits	£1,609 14 5	
Interest on debenture stock	20,500 0 0	
Balance applicable to dividend on the ordinary stock	164,102 13 1	
	£186,212 7 6	

	£ s. d.	£ s. d.
Balance from last account	£167,161 18 7	
Less—Dividend for half year ended Dec. 31, 1895	£139,900 0 0	
Divisible profits carried to reserve fund	8,600 0 0	
	148,500 0 0	
	£18,661 18 7	
Amount from revenue account (No. 4)	167,407 17 1	
Interest on Bankers' balances	142 11 10	
	£186,212 7 6	

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1895.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1896.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	58,729	384,271	398,667	409	43,924
Cannel coal	1,571	331	251*	..	1,651
	60,300	384,602	398,918	409	45,575

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

—	In Store, Dec. 31, 1895.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store, June 30, 1896.
Coke—cwt.†	517,014	4,906,520	918,026	4,203,988	301,520
Breeze—yards	17,042	79,771	14,337	75,894	6,582
Tar—gallons	498,736	4,040,948	27,953	4,010,691	501,040
Ammoniacal liquor—butts	17,683	127,772	52,824	84,395	8,236

* 270,577 gallons of petroleum spirit used as a substitute for cannel. † 1 cwt. of coke about equals 1 sack of 4 bushels, under Weights and Measures Act, 1878.

No. 11.—STATEMENT OF GAS MADE, SOLD, ETC.

Description of Gas.	Quantity made.	Quantity Sold.			Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).	Total Quantity Sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	4,182,668	225,202	3,768,435	3,993,637	59,945	4,053,582	135,086	19,815

No. 12.—BALANCE-SHEET.

To	£ s. d.	£ s. d.
Capital—		
Balance—per account No. 3	£156,311 16 4	
Reserve fund—per account No. 6	84,047 8 6	
Renewal fund—per account No. 7	15,216 14 0	
Insurance fund—per account No. 8	43,134 8 3	
Net revenue account—for balance, per account No. 5	164,102 13 1	
Debenture interest, for amount due to June 30, 1896	19,816 13 4	
Sundry tradesmen, for amount due for coals, stores, and sundries	43,327 5 8	
Deposits by consumers	27,197 10 8	
Dividend account (outstanding)	1,715 15 11	
Debenture account "	8 13 0	
Workmen's bonus and savings deposited with the Company	52,385 13 7	
Officers' superannuation and guarantee funds	26,243 17 1	
	£633,508 9 5	

By	£ s. d.	£ s. d.
Cash at Bankers		£106,683 7 4
Amount invested (reserve fund, £65,662 17s. 8d.; renewal fund, £15,132 10s. 3d.; insurance fund, £41,969 13s. 2d.)		122,765 1 1
Cash in hand for sundry payments		800 0 0
Stores in hand—		
Coals and enriching materials	£24,286 17 10	
Coke and breeze	6,610 15 4	
Tar, sulphate, and ammoniacal liquor	4,846 17 8	
Sundry stores	113,767 19 6	
	149,512 9 11	
Investment of workmen's bonus, &c.		33,026 7 9
Accounts due to the Company—		
Gas meter and stove rental, quarter ending Midsummer, 1896	£158,553 8 5	160,592 10 3
Arrears outstanding	2,039 1 10	
Coke and other residual products		23,147 8 1
Balance due for automatic gas-fittings		34,877 2 4
Sundries		3,104 2 8
		£633,508 9 5

ELECTRIC LIGHTING NOTES.

In view of the proposal of the Hull Corporation Electric Lighting Committee to borrow £42,000 for a new installation of the electric light, the Borough Treasurer (Mr. Milner) has drawn up a financial estimate for 1898, when the old and new stations will be in operation. The total cost of the old station was £5299 15s. 8d.; and for the new station, based on similar calculations, £4489 17s. 6d.—total £9789 13s. 2d. It is computed by Mr. Milner that, under the altered arrangement, the old station will supply 240,000 units, which will realize £5500; and the new station 170,000 units, which will produce £3895 16s. 8d. The meter-rents are estimated at £240 for the old station, and £168 for the new; so that the total income will be £9803 16s. 8d. There will be no charge to the district rate; but a small balance in hand, after having paid the whole of the year's interest, and the sinking fund. This is looking well ahead; and it is to be hoped the Committee will not be disappointed.

A failure in the public lighting is reported from Dublin. From before eleven o'clock on the night of the 24th ult., and through the early hours of the following morning, the electric lamps on the western side of O'Connell Street, and on both sides of Dame Street, were not alight. These important portions of the city thoroughfares were practically in darkness for many hours.

Colonel Marsh, one of the Inspectors of the Local Government Board, sat at the Council House, Bristol, last Wednesday, to receive evidence as to an application by the Corporation for sanction to the borrowing of £75,000 for electric lighting purposes. The Town Clerk (Mr. T. Burges) stated that the objects for which the loan was required were the extension of the existing central station and the laying of distributing-mains to parts of the city at present not supplied. Three loans had already been raised—viz, £66,000 in 1893, £24,000 in 1894, and £10,000 in 1895; making a total of £100,000. The capacity of the existing plant was equal to 34,000 8-candle power lights; and customers using 32,285 8-candle power lamps had already been supplied, or had demanded a supply. After the last loan of £10,000 was obtained for the extension of the mains to districts where the light was used by private customers, they found that a largely increased number could be served without materially increasing the working expenses. He could best show the result of the extensions made in 1895 by saying that in April of that year the sum of £3302 had to be provided out of the district rates; but no such sum had had to be provided for the subsequent two half years—in fact, they had been able to pay the instalments on borrowed capital, as well as the interest, entirely out of the income earned by the works. The Inspector visited the works at the termination of the inquiry.

METROPOLIS WATER SUPPLY.

The Scarcity of Water in East London.

As will be seen by the questions put to the President of the Local Government Board last week, as recorded in our "Parliamentary Intelligence," the curtailment of the supply of water in the district of the East London Company is still giving rise to much agitation. However, notwithstanding the complaints of short supply, early in the week the Secretary of the Company (Mr. I. A. Crookenden), in a letter to Mr. H. H. Marks, M.P., stated that they were drawing their authorized 10 million gallons a day from the Thames, and sending into the district 25 gallons per head; and on Thursday, he said they were pumping "oceans" of water into the district daily, and the people were receiving 30 gallons per head per day. There would be sufficient water for all purposes if the people would only provide utensils in which to keep a reserve while the water was turned off; for it was only a question of household storage. They had erected thousands of stand-pipes in their district; and the Directors were prepared to put up others wherever possible, if necessary. In a long letter to "The Times" on Friday, Mr. Crookenden explained the position of the Company in the present emergency. He denied that there exists anything in the nature of a water "famine;" the quantity supplied twice daily during two periods of three hours each amounting to 30 gallons per head, or sufficient to yield (allowing for supplies for other than domestic purposes) 22 gallons per head per day. This is more than is furnished in many large towns at the best of times. The first cause of the present short supply is, of course, the existing drought, which exceeds that of last year in its duration, and is only a continuance of the condition of things experienced in four preceding years. The next is want of storage accommodation. For this, as has been pointed out over and over again, the Company cannot be held responsible, as was acknowledged by the Inspectors who inquired into the matter on behalf of the Local Government Board. Immediately after obtaining their Act of 1894, the Company commenced their authorized works. They have completed and filled the large extension of the Racecourse reservoir, and have just completed the first of their new reservoirs and are engaged on the second. They hope to complete all within three years of the passing of that Act—that is, within less than half of the seven years allowed. Had their Bill of 1893 been allowed to pass, the Racecourse reservoir would have been finished and available in 1895; their reservoir No. 1, recently finished, would have been completed last year and filled in January of the present year; and their remaining reservoir would have been ready filled in the spring of this year. Mr. Crookenden lays special stress upon the fact that the present inconvenience (which the Company realize and greatly deplore) would scarcely be felt at all if the owners

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 210).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	25½–26½	..	3 19 3
100,000	10	„	7½	Do. 7 p. c.	18–19	+½	3 18 11
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	108–110	..	4 10 11
200,000	10	12 June	5	Belgrano (B. Ayres), Limited	10–10½	–¼	4 15 3
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100–103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7⅞–8¼	+⅛	3 18 9
40,000	5	„	6½	Do. New, £4 paid	5½–6	..	4 6 8
380,000	Stck.	27 Feb.	12	Brentford Consolidated	290–295	..	4 1 4
210,000	„	„	9	Do. New	220–225	..	4 0 0
50,000	„	„	5	Do. 5 p. c. Pref.	—	..	—
159,375	„	12 June	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	27 Mar.	11	Brighton & Hove Original	247–252	..	4 7 3
208,820	„	„	8	Do. A Ord. Stk.	190–195	..	4 2 0
933,500	Stck.	27 Feb.	5	Bristol, 5 p.c. max.	127–132	..	3 15 9
420,000	20	27 Mar.	11½	British	57–58	..	3 17 7
50,000	10	12 Mar.	11½	Bromley, Ordinary 10 p. c.	22½–23½	..	4 17 11
71,000	10	„	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	10½–10⅝	..	4 13 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	102–105	+1	5 14 3
150,000	20	15 July	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	29 May	8	Cape Town & District, Ltd.	17–18	..	4 8 11
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58–60	..	5 0 0
550,000	Stck.	15 Apl.	13½	Commercial Old Stock	343–348	+1	3 17 5
165,000	„	„	10½	Do. New do.	258–263	..	2 19 10
165,000	„	12 June	4½	Do. 4½ p. c. Deb. do.	149–152	..	2 19 2
800,000	Stck	12 June	13	Continental Union, Limited.	285–290	..	4 9 8
200,000	„	„	10	Do. 7 p. c. Pref.	220–225	..	4 8 11
51,600	Stck.	27 Feb.	14	Croydon Com'cial A 10 p. c.	—	..	—
157,500	„	„	11	Do. B 7 p. c.	—	..	—
535,000	Stck.	27 Feb.	5½	Crystal Palace Ord. 5 p.c. Stk	137–142	..	3 13 2
60,000	„	„	5	Do. 5 p. c. Pref.	—	..	—
486,090	10	15 July	11	European, Limited	26½–27½	..	4 0 0
354,060	10	„	11	Do. £7 10s. paid	17½–18½	..	4 9 3
5,746,590	Stck.	13 Feb.	12½	Gaslight & Coke, A, Ordinary	320–325	..	3 18 11
100,000	„	„	4	Do. B, 4 p. c. max.	110–115	..	3 9 7
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	305–315	..	3 3 6
30,000	„	„	5	Do. F, 5 p. c. Prf.	150–155	..	3 4 6
60,000	„	„	7½	Do. G, 7½ p. c. do.	215–220	..	3 8 2
1,300,000	„	„	7	Do. H, 7 p. c. max.	208–213	..	3 5 9
463,000	„	„	10	Do. J, 10 p. c. Prf.	305–315	..	3 3 6
476,000	„	„	6	Do. K, 6 p. c. Prf.	175–180	..	3 6 8
1,061,150	„	12 June	4	Do. 4 p. c. Deb. Stk.	138–143	..	2 15 11
294,850	„	„	4½	Do. 4½ p. c. do.	153–158	..	2 16 11
908,000	„	„	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	14 May	6	Hongkong & China, Limited	12½–13½	..	4 8 10
3,800,000	Stck.	14 May	12	Imperial Continental	253–258	..	4 13 0
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Feb.	3½	Do. 3½ p. c. Deb. Stk „	110–112	..	3 2 6

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	115–118	..	4 4 10
250,000	100	„	4½	Do. 4½ p. c. Debs.	110–112	..	4 0 4
541,920	20	12 June	5	Monte Video, Limited	16½–17½	..	5 14 3
150,000	5	29 May	8	Oriental, Limited	8¼–8⅜	..	4 11 5
135,000	5	„	8	Do. New, £4 10s. paid	7¼–7½	..	4 12 10
15,000	5	„	8	Do. do. 1879, £1 paid	1–2	..	4 0 0
60,000	5	12 Mar.	7	Ottoman, Limited	5–5½	..	6 7 3
166,870	10	—	2	Para, Limited	1½–1⅝	..	—
420,000	100	1 May	6	People's Gas } 1st Mtg. Bds.	105–110	..	5 9 1
500,000	100	1 June	6	of Chicago } 2nd Do.	102–107	..	5 12 1
250,000	10	27 Mar.	8	San Paulo, Limited	13½–14½	+½	5 10 4
500,000	Stck.	13 Feb.	15½	South Metropolitan, A Stock	410–420	..	3 13 9
1,350,000	„	„	12	Do. B do.	320–330	..	3 12 9
310,000	„	„	13	Do. C do.	340–350	..	3 14 3
820,000	„	15 July	5	Do. 5 p. c. Deb. Stk.	173–176	..	2 16 10
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	250–255	..	4 10 2
60,000	„	„	8½	Do. B	—	..	—
170,380	10	29 May	10	Tuscan, Limited	13½–14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	98–100	..	5 0 0
				WATER COMPANIES.			
746,123	Stck.	26 June	10½	Chelsea, Ordinary	345–350	..	2 18 7
150,000	„	„	5	Do. 5 p. c. Pref.	170–175	..	2 17 1
160,000	„	„	4½	Do. 4½ p. c. Pref. Stk., 1875	—	..	—
175,785	„	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	158–163	..	2 15 2
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	237–242	–1	2 17 11
654,740	„	26 June	4½	Do. 4½ p. c. Deb. Stk.	156–159	..	2 16 7
100,000	„	„	3	Do. 3 p. c. Deb. Stk.	104–106	..	2 16 7
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	123–127	..	2 19 0
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	149–153	..	2 12 4
708,000	Stck.	13 Feb.	12	Kent	352–357	..	3 7 3
160,000	„	„	7	Do. New, 7 p. c. max.	222–227	..	3 1 8
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	270–275	–2	2 14 6
406,200	100	„	7½	Do. 7½ p. c. max.	227–230	..	3 5 2
350,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	147–152	..	2 12 8
500,000	100	13 Feb.	12½	New River, New Shares	439–444	..	2 17 6
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	157–160*	+2	2 10 0
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	157–162	–1	2 9 4
126,500	100	„	4	Do. Do. 7½ p. c. Max.	150–155	–5	2 11 7
489,200	Stck.	„	5	Do. Do. 5 p. c. Pref.	172–177	+5	2 16 6
1,019,585	„	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	147–152	..	2 12 8
1,155,066	Stck.	12 June	10	West Middlesex	328–333	+1	3 0 0
200,000	„	„	4½	Do. 4½ p. c. Deb. Stk.	157–162	..	2 15 6

*Ex div.

of houses in the East-end would put up the usual storage cisterns. On this point the Inspectors reported last year that "the inconvenience then experienced was much aggravated by the want of proper means for domestic storage of water," and that they "considered there would be a distinct advantage in having properly designed means for storage of water in houses." This the Company have always urged. They would be able to restore the constant supply far sooner if they could only induce consumers to put a check on the waste of water. It has been suggested that the Company are favouring their customers who pay for water by meter over those who pay by rate for ordinary domestic purposes. The Company repeat what they proved before the Inspectors last year, that there is absolutely no foundation for such a suggestion. They have now been able to arrange for an auxiliary supply from the New River Company.

Last Thursday afternoon, a conference, convened by Canon Barnett, was held at Toynbee Hall, Whitechapel, when representatives from the several East London districts attended. The reverend gentleman, in opening the proceedings, said they would do well not to spend time in abusing anybody, but consult as to the practical way of meeting pressing difficulties, and of avoiding them in the future. The immediate needs of the people were of the first importance; and it was imperative that some remedy should be provided. Sir S. Montagu moved—"That this meeting is deeply impressed with the evil effects of the short supply of water in the East-end of London, and calls upon the Government to assist or compel the Company to obtain sufficient water for the present needs of the district." Mr. H. Robertson seconded the motion; and it was carried by acclamation. Mr. H. Ward moved a resolution to the effect that as, during the intermittent supply, many houses had no water at all, the Government be urged to introduce a Bill into Parliament by which the exceptional powers of the East London Water Company, as regarded the length of service, might be modified or brought into conformity with the powers and obligations of other London Water Companies. This was carried; and a deputation consisting of the authorities invited to the conference was appointed to wait immediately upon the President of the Local Government Board.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A question of some importance to owners of gas and water works was discussed in the Glasgow Town Council on Monday. There is at present before Parliament a Bill to alter the method of rating agricultural land in Scotland, in order to give relief to the agricultural class. This is to be effected by a provision that such land is to be rated for local purposes upon one-fourth of the real value; and the loss of rates thus inflicted upon Local Authorities is to be made up by a Government grant amounting to £192,000. The Bill affects Glasgow—and other places in a greater or less degree—in this way, that the Corporation are owners of works which are not agricultural in parishes outside the municipal boundary, in some of which, under provisions of an Act of Parliament passed some time ago, a number of Local Authorities classified valuations for certain purposes, the classification being left to the Local Authorities themselves; that, under the Public Health Acts, all underground gas and water works are assessed at one-fourth of their ascertained value; and that the Corporation will, under this Bill, lose the benefit of all these classifications. While agricultural land will be rated at one-fourth, gas and water works will be rated at their full value. There is this element also that, so long as the proposed arrangement may last, agricultural land will be assessed at one-fourth, and no more; and should occasion require—such as the building of an hospital, the meeting of outlays in connection with epidemic, the cost of litigation, &c.—that a greatly increased sum should be raised from the rates, the increase will fall upon ratepayers who are not agricultural, and consequently in part upon the owners of gas and water works. The contingent liabilities can therefore not be calculated; but that the Bill will increase the rates upon gas and water works in outside parishes is certain. Another view of the Bill besides this was put forward in the Town Council; but it was more political than municipal, and is not of so much importance here. It was to the effect that, whereas Glasgow will benefit by being relieved of £2600 which is raised in the City in name of land-tax, the citizens will have to contribute over £36,000 to the Imperial Exchequer towards meeting the grant of £192,000. The Council, after a good deal of discussion, adopted the safe course of instructing their Parliamentary Bills Committee "to take such action as will protect the interests of the Gas and Water Trusts." Whether they will get relief is not certain, because the Bill must be passed this session, in order to place Scotland on a footing of equality with England under a Bill already passed.

The Edinburgh and Leith Gas Commission had their annual accounts before them on Monday. The Treasurer (Mr. Gibb) read the certificate of the Auditor (Mr. H. K. Shiells) to the effect that the annual accounts had been correctly stated and sufficiently vouched. The Chairman (Bailie Kinloch Anderson), in moving that they be adopted, said that the capital account showed an increase of £24,476. This was accounted for to the extent of £10,711 for coal breaking and mechanical stoking plant in the Edinburgh works; to the extent of £719 by the purchase of the Corstorphine Gas-Works; and to the extent of £10,149 by the cost of repairs and extensions of main and service pipes. The increase was £4800 more than in the previous year. The extensions of mains were chiefly in the southern district of Edinburgh. Gas-meters cost £2775, which was £1000 more than in the previous year; the increase arising from the larger number of new meters required for new properties. Gas-cookers added £120 to the capital account. The outcome was that £47,047 had been paid on its behalf. As the working balance at May 15 was only £38,803, the Commissioners authorized a temporary loan of £50,000 from the bank for three months. It would fall to be considered whether this loan should not be raised in the usual way by mortgage. In the revenue account, manufacture of gas had cost more by £2074. As to coal, 9586 tons more than in the preceding year had been used, but at a cost of £2852 less. Purifying materials had cost more by £3707, chiefly on account

NEW "PENNY-IN-THE-SLOT" COOKERS.

Arranged specially for Prepayment Meters.

We have given particular attention to the strength and simplicity of these Cookers, which are constructed upon the principle of our celebrated "Eureka" Cooker, and are practically indestructible. They are very easily cleaned, and are all constructed in as many parts as possible, so that, in case of breakage, the parts may be readily and cheaply replaced.

No. 403 and 404.

No.	External Dimensions.			Oven.			Hot Plate.	No. of Boiling-Burners	Price.	White Enamelled Crown extra.
	High.	Wide.	Deep.	High.	Wide.	Deep.				
401	18½	13½	11½	14	11	9½	13½ by 11½	1	28/6	—
402	24½	15½	15	18	11	11	15½ „ 15	2	40/-	2/6
403	30	18	17	19	11	11	18 „ 17	2	45/-	2/6
404	30	18	17	19	13½	11	18 „ 17	2	50/-	2/6
404	If fitted with Enamelled-Lined and Jacketted Door and Fire-Brick Crown, as adopted by The London Gaslight and Coke Co.								55/-	2/6

Any of these Cookers, except No. 401, can be fitted with Griller at an extra charge of 2/6; but the adoption of the Griller is not recommended for use with Prepayment Meters.

JOHN WRIGHT & CO., LIMITED,

The Oldest and Largest Gas-Stove Manufacturers in the World,

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of the larger quantities used. Repairs and maintenance of works and plant had cost £2219 more, mainly on account of the condition of the chimney at the Edinburgh works, and the necessity for building a temporary one. The distribution of gas cost more by £5818. On the revenue side, 48,240,400 cubic feet more gas had been sold; the income from which had been £7951 less, which arose on account of their having reduced the price from 3s. 2½d. to 3s. per 1000 cubic feet. On coke there had been a decrease of £1010; on tar and ammoniacal liquor, of £4828; and on waste lime, of £34—a total of £5863. The result of the whole was that the balance carried to profit and loss account was £8418 less than was necessary to make the usual contributions to the sinking fund for the year. This, however, was anticipated to a large extent when the reduction in the price of gas was made. They then fixed the price at 3s., when it would have required 3s. 0½d. to have met the cost. But they knew that they had a large reserve fund, which had been increasing annually; and they thought they would be justified in fixing the price at 3s. He thought they had been. They would, however, almost have had sufficient funds, if it had not been for the enormous reduction in residual products—nearly £6000. The deficit, but for that, would only have been about £2000. They had entered into very favourable contracts for the current year; and he did not expect that, when they came to fix the price of gas in September, they would require to raise it. The accounts were unanimously agreed to; and the Commissioners, adding the £47,032 brought forward from the previous year to the £38,803 the surplus on the year, paid the usual outlays, made the minimum contribution of £8521 to the sinking funds, and carried forward £38,613.

The Chairman said they would observe that the output of gas for the past month exceeded that for the corresponding period of last year by over 6½ million cubic feet, so that they were holding their own against the electric light and all other illuminants. He also stated that they did not expect that the carburetted water-gas plant would be completed by next winter; but they would have the purifiers for this plant ready for use with the coal gas, which would be a great benefit, as last winter they were overtaxed for purifier accommodation.

I mentioned three weeks ago that the Brechin Gaslight Company were about to issue 30 shares of £10 each, to be offered to the present shareholders. Tenders for the new stock were opened on Wednesday; and the result was that, the minimum price being £22 per share, offerers of £25 5s. received about one-third of the number of shares they applied for, and all above that sum received the full number. The average price realized was £25 7s. 3d.

It is reported that a strike broke out last Saturday among the stokers and firemen in the Falkirk Corporation Gas-Works, the occasion of which was a proposal by the Manager to alter the terms of payment. The wages were 27s. 9d. per week for stokers and 30s. per week for firemen; and the proposal was to pay the men at the rate of 2½d. per 1000 cubic feet of gas made. The men took up the position that payment by piecework was unknown in other gas-works in the country, and was quite impracticable. They also said that the proposal, if adopted, would mean a reduction in their present rate of wages, which were already under the average paid elsewhere; and they demanded a rise of 2s. 3d. per week.

At a meeting of the Paisley Town Council in committee on Thursday, it was agreed to allocate part of the surplus on the Corporation gas undertaking as follows: Electric lighting of Town Hall, £762; upkeep of Dunn Square (recently presented to the town), £105; of Brodie Park, £192; of St. James's Park, £85; and of the new Quarry Park, £400—total, £1544. The price of gas is to remain as last year.

Early on Thursday morning, a fire broke out in South Back of Canongate, Edinburgh, in a stable which had on one side close to it one of the large gasholders belonging to the Edinburgh and Leith Gas Commissioners, and immediately behind it a chemical works. The fire was mostly confined to a hay and straw store, and made a big blaze. On account of the proximity of such dangerous materials, there was some anxiety for a time; but the flames were got under without anything happening to either the gasholder or the chemical works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 31.

Sulphate of Ammonia.—The week has practically produced no change in the market. A fair amount of business has been done, and the demand has checked the downward tendency of values; but it has not been sufficiently large to produce any quotable improvement. The business has been chiefly confined to Scotland. The bulk of the requirements being on the part of dealers to cover previous sales, their orders have been attracted by the ample supplies, and easy values of the Scotch market. The nearest closing value is still £7 13s. 9d. f.o.b. Leith. The other ports have been neglected. But, the production being small, there has been no pressure to sell; and values remain unchanged—£7 17s. 6d. per ton f.o.b. Hull, and £8 per ton f.o.b. Liverpool. As regards forward delivery, Scotch makers are the only ones disposed to sell. Speculators are, however, offering at lower prices, without meeting with success; buyers meantime showing a disposition to hold aloof.

Nitrate of Soda is firm at 7s. 10½d. per cwt. for ordinary, and 8s. for refined.

LONDON, *July* 31.

Tar Products.—The chief feature of the week has been a renewed spurt in the value of benzols. Unfortunately, manufacturers have, in accordance with the custom of the trade, booked their production to the end of the year at least, at prices much below to-day's quotations. Whether the largely improved value of benzols is due to an increased

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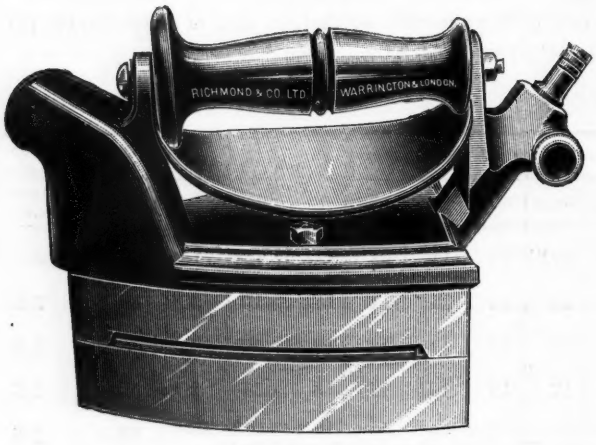

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demand for anilines, or for carburetting gas, or is due to speculation, it is difficult at the moment to decide. A fair demand has sprung up for creosote and other tar oils, which is deleting some of the large stocks that were in existence a few months ago. Anthracene is steady at Committee's quotations. Carbolic acid is also in good request, at improving rates. Solvent naphtha is in moderate inquiry, while crude naphtha so far does not respond as it should to the higher prices of benzols.

Business has been done during the week at the following rates: Tar, 18s. 6d. to 26s. Pitch, 32s. 6d. Benzols, 90's, 3s. 6d.; 50's, 2s. 6d. Toluol, 2s. 4d. Solvent naphtha, 1s. 3½d. Crude, 30 per cent., naphtha, 1s. Creosote, 1½d.; fluid, 2½d. Naphthalene, pressed, £3 7s. 6d.; salts, 35s. Cresylic acid, 1s. Carbolic acid, 60's, 2s. 2½d. Anthracene, "A," 11d.; "B," 8½d. to 9½d.

Sulphate of Ammonia.—There is still a very slack market; and buyers are waiting for lower prices; in some instances offering as low as £7 11s. 3d. northern ports. Quotations are, however, £7 12s. 6d. Eastern and Western ports, less 3½ per cent. Gas liquor, 6s. to 7s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The chief event during the past week in the coal trade has been the break up of the Conciliation Board. This has, in well-informed quarters, been anticipated for some time past; but with regard to any serious trouble following, there has been no real apprehension on the part of leading representatives, either among the coalowners or the miners. The excitement which has been created by the so-called "coal crisis" has been altogether groundless. Beyond the disappearance of the Conciliation Board, the position in all probability will remain practically unchanged; collieries continuing to work under much the same conditions as have prevailed for some time past. The anxiety on the part of consumers during the past month to get in extra supplies, in view of possible contingencies, has created an abnormal demand for nearly all classes of fuel. It is, however, only in very special cases that any attempt has been made to put up prices, and practically except that they have been firm at list rates, they remain unchanged. At the pit mouth, present prices can scarcely be quoted more than about 10s. per ton for best Wigan Arley; and 8s. to 9s. for Pemberton four-feet and seconds Arley.

Northern Coal Trade.—There has been an increased demand for both steam and gas coal in the last few days; and the gas coal collieries are decidedly brisker, though they are not yet working full time. The shipments to the great companies in the South have been satisfactorily enlarged; while the local demand is also better and increases weekly. The price of best Durham gas coals may be quoted at about 6s. 6d. to 6s. 9d. per ton f.o.b.; and the quotation is stiffening. Second-class qualities are about 3d. per ton lower. The foreign demand seems to be rather above the average just now. The movement in the gas coke trade is rather an unequal one; there is an increase in the production that must continue, and the sales do not in all cases seem to be enlarged as rapidly. The household requirements seem to be a little more than they were; but the demands of the manufacturers and the exports do not show the same increases. There is no alteration in the price this week.

Scotch Coal Trade.—Most of the holidays are over; and the miners have settled down steadily to work. Along with the increased output, there has also arisen a better demand, with the result that prices have begun to rise. Ell of the better qualities is in good request; and main is going off steadily. Splint has experienced less of the improvement than any. The prices quoted are: Main, 5s. 9d. per ton f.o.b. Glasgow; ell, 6s. 6d. to 7s.; and splint, 6s. 6d. The shipments for the week amounted to 136,163 tons—a decrease upon the quantity in the preceding week of 29,818 tons, and as compared with the corresponding week of last year of 24,459 tons. For the year to date, the total shipments have amounted to 4,133,630 tons—an increase over the quantity in the same period of last year of 218,839 tons.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 800 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1899, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c. 120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SPENT OXIDE Wanted. J. HARDMAN, Milton, STAFFS.

SULPHURIC ACID for Sale (B. O. V. and R. O. V.) made from Spent Oxide. J. HARDMAN, Chemical Works, Milton, STAFFS.

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND Co., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.
BROTHERTON AND Co., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND Co., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c.
CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

NOTICE OF REMOVAL.

R. ANDREWS, Practical Retort Setter, HAS REMOVED from Sugden Road, Lavender Hill, to 9, JESSICA ROAD, WANDSWORTH COMMON (West Side), LONDON, S.W.

ADVERTISER (aged 21) desires a situation as ASSISTANT to Manager of a Provincial Gas Company. Six years' Experience, and holds First-Class Certificate for Gas Manufacture.
Address M.D., BOX 501, Sell's, FLEET STREET, E.C.

WANTED, a Situation as Gas Manager or ASSISTANT in Gas-Works. Four Years' Experience in Gas-Works. Five Years Assistant in Water Engineer's and Burgh Surveyor's Office, and Four Years in Mechanic's Shop. Good Draughtsman and Chemist. Highest References.
Address No. 2683, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Small Gas-Works, a good STOKER, used to Shovel Work, and to make himself generally useful.
Apply to the MANAGER, Gas Company, Knighton, RADNORSHIRE.

WANTED, a first-class Gas-Fitter. Must be well up in Iron and Compo., and used to Stove Fixing. Wages 29s. weekly.
Apply, by letter only, to W. S. M'GREGOR, Manager and Secretary, Gas-Works, Longton, STAFFS.

WANTED, two or three good Stokers. Must be industrious and sober. Used to Shovel Charging, Engine and Exhauster. Constant Employment, if found suitable for the work. Wages 24s. 6d. per week.
Apply to JNO. CHURCH, Gas-Works, LYMINGTON.

WANTED, for the Gas Department of a Corporation, an OUTDOOR SUPERINTENDENT to take the Supervision of Internal Fitting Work, Main and Service Laying, Fixing and Repairs of Cooking and Heating Stoves, &c.
Applicants to give References only, and to state Age and Experience.
Applications to be addressed No. 2686, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHELMSFORD GASLIGHT AND COKE COMPANY.

WANTED, an experienced Manager, competent to superintend all Departments of the Manufacture and Distribution of Gas, the working of Sulphate of Ammonia Plant, and laying and repairing Mains, Services, &c. About 3500 Tons of Coal carbonized annually.
Salary £180, with a prospect of some increase if the results are satisfactory.
For full Particulars as to Duties, &c., apply (by letter) to the SECRETARY, Gas-Works, CHELMSFORD.

WANTED, a thoroughly practical Gas-FITTER to undertake Repairs to a Gas System, and with a knowledge of Gas Distribution. Wages, 5s. a day for seven days in week; working hours from nine a.m. till twelve noon, and one p.m. to 5.30 p.m., Saturdays nine a.m. to twelve noon, unless required to attend to urgent Repairs. In addition, he will be required to attend at the Office each evening (including Sunday), from hour of lighting gas till nine p.m., in case his services may be required for escapes, &c. None but those of strictly sober and trustworthy habits need apply.
To a suitable man, the post would be a permanency.
Apply to the DIVISION OFFICER, Royal Engineers, Wellington Lines, ALDERSHOT.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS.
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS,
Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

It is Worth Your While to Buy DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY SUPPLY on APPROVAL "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Liquids for Gas Making, Enriching, &c.
RELIANCE LUBRICATING OIL COMPANY, WATER LANE, GREAT TOWER, LONDON, E.C.
Depôts at Liverpool, Bristol, Hull, Glasgow and Newcastle-on-Tyne. Telegrams: "Subastral, London."

WANTED, Bricklayers used to Retort Setting and General Brickwork of Gas-Works.
Apply at once, by letter, to No. 2689, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COLLECTOR Wanted for a large Provincial Gas Company in the North of England. A young Man with some experience in general Office Work and Collecting preferred. Salary to commence with would be £130 per annum.
Applications, stating Age and Experience, with Testimonials, to be addressed, not later than the 7th of August, to No. 2690, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

UPTON-ON-SEVERN GAS COMPANY.

REQUIRED, a reliable and steady Man, Good Carbonizer, to take charge (at once) of these Works. House, Coal, and Gas are provided free.
Applicants to state, in own handwriting, Age, Experience, and Salary required, not later than the 12th of August, 1896, to the undersigned, who will give further Particulars on application.
JOHN HENRY LYON.
Lynton, Malvern Link.

ROBERT DARNEY, of Faversham, Kent, will be glad to receive OFFERS for Ten SHARES in William Sugg and Co., Limited.

PURIFIERS for Sale, owing to Alterations and Extensions in the Purifying Department at the Birkenhead Gas-Works—
Three Sets of four PURIFIERS, each Box being 14 feet square, and each set worked by a 14-inch Centre-Valve.
Also one set of two PURIFIERS, same size as above, worked with Two 20-inch Four-Way Valves and Connections.
The Purifiers may be seen upon application to Mr. T. O. Paterson, Gas-Works, Birkenhead; and further Particulars and Prices can be obtained from R. & J. DEMPSTER, LIMITED, Gas Plant Works, Newton Heath, MANCHESTER.

HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, LIMITED.

THE above Company have for Sale—
Two STATION METERS, 1200 cubic feet per hour, and 3600 cubic feet per hour, with Valves.
One 8-inch GOVERNOR, with Valves.
One 8-inch FOUR-WAY RACK-VALVE.
Two 8-inch FOUR-WAY CENTRE-VALVES.
Nine 20 in. by 14 in. ⌂ MOUTHPIECES.
Two Self-sealing MOUTHPIECES, 20 in. by 14 in.
HYDRAULIC MAIN, Wrought Iron, 14 in. by 14 in., suitable for three Beds of five Retorts.
Twelve 14 in. by 12 in. ⌂ MOUTHPIECES, with Lids and Screws complete.
Seventeen 4-inch H and DIP PIPES.
Fourteen ASCENSION-PIPES.
For further Particulars, apply to
JAMES DOUGALL,
Engineer and Manager.
Gas-Works, Hoylake,
July 25, 1896.

BRISTOL GAS COMPANY.

TENDERS FOR GAS COAL AND CANNEL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of their requirements (say, 160,000 Tons) of GAS COALS, during the Year ending the 30th of September, 1897.
The Stapleton Road Works are now connected by Sidings with both the Great Western and Midland Systems.
Particulars and Forms of Tender may be obtained on application to the undersigned, to whom also tenders, sealed and endorsed "Tender for Coal," must be delivered not later than Ten a.m. on Wednesday, the 2nd day of September next.
JOHN PHILLIPS,
Secretary.
Chief Offices: Canons' Marsh, Bristol,
July 23, 1896.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

THE LAW GUARANTEE & TRUST SOCIETY, LD., GUARANTEES FIDELITY.

SEND for complete Prospectus containing Balance-Sheet, Copy of Policy, &c., &c. Mortgage, Debenture, License, and Contingency Insurance.
Head Office: 49, CHANCERY LANE, LONDON, W.C.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for SPENT OXIDE.
Specification and Form of Tender may be obtained from Mr. Whatmough, Gas Manager.
Tenders, endorsed "Spent Oxide," to be sent to me not later than Tuesday, Aug. 18, 1896.
By order,
A. B. PILLING,
Town Clerk.
Municipal Buildings, Heywood,
Aug. 1, 1896.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for SULPHURIC ACID, and TUBES and FITTINGS.
Specifications and Forms of Tender may be obtained from Mr. Whatmough, Gas Manager.
Contractors tendering for this work must pay their workpeople at least the standard or trade union rate of wages, and observe the trade conditions which attach to the various kinds of work for which the tender is sent in.
Sealed and endorsed tenders to be sent to me not later than Tuesday, Aug. 18, 1896.
By order,
A. B. PILLING,
Town Clerk.
Municipal Buildings, Heywood,
Aug. 1, 1896.

LEIGH URBAN DISTRICT COUNCIL.

THE Gas Committee of the Leigh Urban District Council invite TENDERS for the supply of 10,000 Tons of GAS COAL and 1000 Tons of CANNEL for the Year ending the 30th of June, 1897.
Specifications, with Tender Forms and all Particulars, may be obtained from the undersigned.
Sealed tenders, endorsed "Coal" or "Cannel," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leigh, not later than Ten a.m., on Friday, the 7th of August next.
The lowest or any tender not necessarily accepted.
ALFRED T. FLETCHER,
Engineer and Manager.
Gas-Works, Leigh, Lancs.,
July 23, 1896.

LEIGH URBAN DISTRICT COUNCIL.

THE Gas Committee of the Leigh Urban District Council, invite TENDERS for the LABOUR required in the RE-SETTING of Seven Beds of Inclined Retorts.
All Particulars may be obtained from the undersigned.
Sealed tenders, endorsed "Re-setting Retorts," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leigh, on or before Monday, the 10th of August next.
The lowest or any tender not necessarily accepted.
ALFRED T. FLETCHER,
Engineer and Manager.
Gas-Works, Leigh, Lancs.,
July 29, 1896.

LEIGH URBAN DISTRICT COUNCIL.

THE Gas Committee of the Leigh Urban District Council invite TENDERS for the purchase of the surplus TAR produced at their Gas-Works, for a period of One Year from the 1st of September next.
All Particulars with Form of Tender may be had from the undersigned.
Sealed tenders, endorsed "Tar," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leigh, on or before Monday, the 10th of August next.
The highest or any tender not necessarily accepted.
ALFRED T. FLETCHER,
Engineer and Manager
Gas-Works, Leigh, Lancs.,
July 29, 1896.

ACCRINGTON AND CHURCH OUTFALL SEWERAGE BOARD.

THE Board are prepared to receive TENDERS for the supply of 1200 Tons of best quality FORKED COKE, to be delivered at the Railway Station, Church, or by Canal at the Board's Wharf, Coppy Clough, Church.

Parties tendering must state the percentage of Cannel and the quality of Coal used.

Tenders to be delivered to me not later than Monday, the 10th day of August next.

WILLIAM J. NEWTON, C.E.,
Engineer to the Board.

Town Hall, Accrington,
July 29, 1896.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

OXIDE OF IRON.

THE Gas Committee are prepared to receive TENDERS for the supply of 500 Tons of OXIDE OF IRON for Purifying the Gas at their Works.

Forms of Tender and further Particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Oxide of Iron," to be sent to me not later than Five p.m., on Thursday, Aug. 13, 1896, addressed to the Chairman of the Gas Committee, Town Hall, Salford.

By order,
SAMUEL BROWN,
Town Clerk.

Town Hall, Salford,
July 31, 1896.

CORPORATION OF LEICESTER.

PURIFIER-GRIDS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the Supply and Fixing of GRIDS for five Purifiers, 32 feet square, at their Aylestone Road Works.

Specification and Form of Tender may be obtained upon application to the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Purifier-Grids," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, the 8th of August next.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane, Leicester,
July 20, 1896.

UXBRIDGE AND HILLINGDON GAS CONSUMERS' COMPANY.

TAR.

THE Directors are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works during the ensuing Twelve Months from the 1st of September next.

The quantity of Tar will be about 85,000 gallons, and will be delivered free into Contractor's Barges alongside the Works, on the Grand Junction Canal.

Tenders, endorsed, must be addressed to the Chairman, and be delivered at the Company's Offices, High Street, Uxbridge, not later than Monday Evening, the 10th of August.

The Directors do not bind themselves to accept the highest or any tender.

Further Particulars may be obtained of the undersigned.

(Signed) S. PENNY, Assoc.M.Inst.C.E.,
Engineer and Manager.

Uxbridge, Middlesex,
July, 1896.

BOROUGH OF BEVERLEY.

TENDERS FOR COAL.

THE Gas Committee are desirous to receive TENDERS for the supply of COAL for a period of Twelve Months from the 1st of October next, to be delivered, as from time to time directed, by and at the expense of the Contractors, f.o.b. at Keadby, or at the Pits, or at the Railway Station, Beverley, according to the terms of contract.

The Coal to be of the best kind, well screened, free from Sulphur, Bats, Bind, Refuse, and Dirt, and to be weighed (21 cwt. to the ton) upon the Corporation Machine.

Payments will be made monthly, so long as the Contract shall be duly fulfilled.

The Corporation do not bind themselves to accept the lowest or any tender.

Further Information may be obtained of the Gas Manager (Mr. James Gibson) at the Gas-Works, Beverley; and tenders, endorsed "Tender for Coal," must be delivered at my Office not later than Monday, the 24th of August, 1896.

By order,
J. WILLIS MILLS,
Town Clerk.

Guildhall, Beverley,
July 31, 1896.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company, will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 21st day of August, 1896, at Twelve o'clock at Noon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 8th to the 21st of August, both inclusive.

By order of the Board,
ALFRED LIASS,
Secretary.

Offices: 30, Gracechurch Street,
London, July 24, 1896.

NORTH OF IRELAND ASSOCIATION of GAS MANAGERS.

THE

ANNUAL MEETING

Of this Association

WILL BE HELD IN THE

TOWN HALL, HOLYWOOD,

ON TUESDAY, AUG. 11, 1896.

The Chair will be taken at 11.30 a.m. by the President, Mr. T. FRIZELLE, Holywood.

The Business will consist of the President's Address; Papers by Mr. A. Gibb, on "New Gas-Burners," and by Mr. W. Miller, on "Difficulties I have Met with, and How They have been Overcome;" a Conversation on "Loss by Leakage, or Unaccounted-for Gas," introduced by Mr. P. J. Salmon; and a Lecture (illustrated by Experiments), by Professor W. Ivison Macadam, F.R.S.E., F.I.C., F.C.S., on "The Chemistry of Ammoniacal Liquor."

By the courtesy of the Directors of the Holywood Gas Company, Luncheon will be provided for the Members at 2.30 p.m.; and Tea will be supplied by the Committee at the close of the Meeting.

THE GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £150,000 ORDINARY "A" CONSOLIDATED STOCK.

IN pursuance of The Gaslight and Coke Company Act, 1876, Notice is Hereby Given that it is the intention of the Directors of this Company to sell, BY TENDER, £150,000 of NEW ORDINARY "A" CONSOLIDATED STOCK of the Company, to be paid up in full on or before the 31st day of August next; such Stock being Additional Capital proposed to be raised, in pursuance of the Powers of the said Act, under the authority of a Resolution to be submitted to the Half-Yearly Ordinary General Meeting of the Proprietors of the Company, to be held on the 7th day of August next.

Particulars and Conditions of Tender may be obtained on application at this Office; and sealed tenders must be sent in not later than Twelve o'clock (noon) on Monday, the 10th day of August next.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., July 30, 1896.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 21st day of August, 1896, at Three o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 7th day of August until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works: Lower Sydenham, S.E.,
Aug. 4, 1896.

COLNEY HATCH GAS COMPANY.

NOTICE OF GENERAL MEETING.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, New Southgate, on Thursday, the 13th day of August prox., at Five o'clock in the evening precisely, to receive the Report of the Directors, and the Accounts of the Company for the Half Year ended the 30th of June, 1896, to declare Dividends, to increase the Remuneration of the Directors, and for other purposes.

By order,
ERNEST L. BURTON,
Secretary.

New Southgate,
July 29, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

Price 5s. per 100.

THE USE OF

GAS LIME IN AGRICULTURE.

By Dr. A. VOELCKER.

A 4pp. Leaflet for Distribution among Farmers and others.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.

Nov. 30, 1895.

Fcap. 4to, Cloth, price 7s. 6d., post free

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

ARMSTRONG'S
PATENT

CANDLE SAFETY LAMPS

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

TAR AND LIQUOR PURCHASED.

MAJOR & CO., Limited,

SUCCESSORS TO
JOHN CLARKSON MAJOR,
(Established 1851)
Tar Distillers and Manufacturing Chemists,
HULL & WOLVERHAMPTON.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

ARROL-FOULIS

PATENT AUTOMATIC MACHINERY

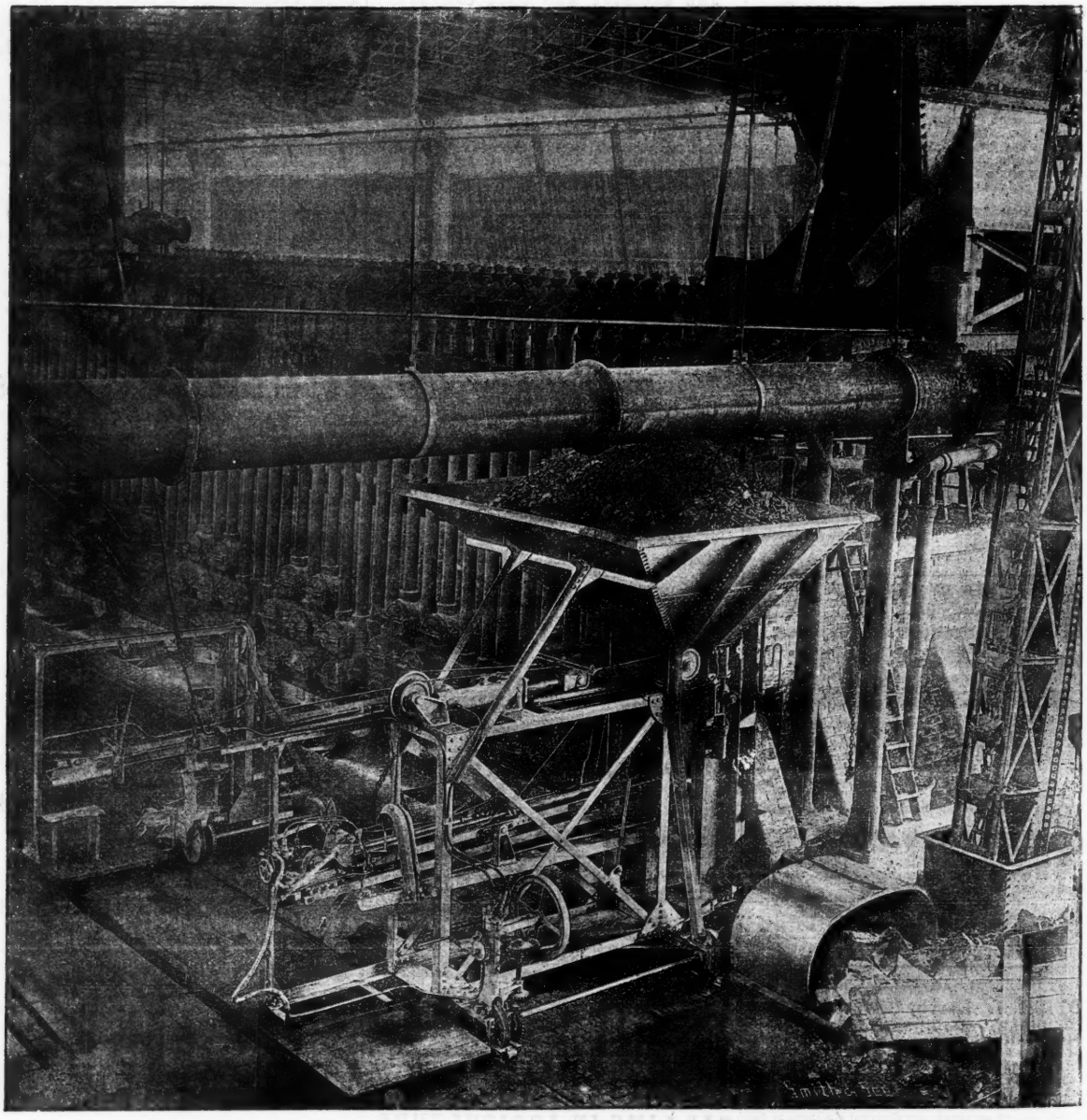
FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,

GLASGOW.

Plans and Estimates furnished on application.



The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours. 102 Drawing-Machines and 70 Charging-Machines are at work, or in course of construction.**

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED,

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT, WHETHER MAKERS, WHOLESALE DEALERS, RETAILERS, or USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.

Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895*,

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c. apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

PRICE'S COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

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LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal*; and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

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HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

Shipments Promptly and Carefully Executed.

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OXIDE OF IRON.

James Hunter, Miner, and Shipper of

NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

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Telegrams: "Hunter, Port Glasgow."

Established 1872.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

Analysis—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

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W. H. PARKINSON,

Fitter.

LITTLE & GRAHAM, Ld.

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SPECIALISTS

TRANSPORT APPLIANCE WORKS,

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FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.

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SHEAF WORKS, SHEFFIELD,

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FOR ENGINEERS.

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SPANNERS, RATCHET BRACES, LIFTING JACKS,

ANVILS, VICES,

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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

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TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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THOS. W. DANCE & SONS,

Coal Owners, Newcastle-on-Tyne;

OR

E. FOSTER & CO.,

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THE "SIMPLEX" CARBURETTER

W. E. PRICE'S PATENT.

A NEW AND PERFECT METHOD OF ENRICHING GAS IN LARGE OR SMALL QUANTITIES AT A MOMENT'S NOTICE.

Special Features of the "SIMPLEX"—

SIMPLICITY, PERMANENCE OF RESULTS, CHEAPNESS, AND ENTIRE ABSENCE OF CONDENSATION.

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GIBBONS Bros., Ltd., DUDLEY.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Preston	1,500,000 ,,
Glasgow	300,000 ,,	Southport	750,000 ,,
Brussels	700,000 ,,	Bath	1,000,000 ,,
Liverpool	3,500,000 ,,	New York	1,200,000 ,,
Tottenham	750,000 ,,	Newburgh, N.Y.	350,000 ,,
Santiago	400,000 ,,	Tottenham (Second Contract)	750,000 ,,
Swansea	750,000 ,,	St. Joseph, Mo.	750,000 ,,

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Edinburgh	2,000,000 Cub. Ft
Shanghai	225,000 ,,	Stockton-on-Tees	500,000 ,,
Winchester	200,000 ,,	Stockport	500,000 ,,
Hoylake	125,000 ,,	Norwich	1,000,000 ,,
Manchester	3,000,000 ,,	Guildford	350,000 ,,
Brussels (Second Contract)	700,000 ,,	Syracuse, N.Y.	850,000 ,,
Holyoke, Mass.	600,000 ,,	Bordentown, N.J.	125,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

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Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

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WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

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BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
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JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

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ALDER AND MACKAY,

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IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

ORIGNAL MANUFACTURERS OF DRY METERS IN CAST-IRON CASES.

STATION METERS, EXPERIMENTAL METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

Results of Tests of Dry Gas-Meters (Section III.) of the Glasgow Philosophical Society's Gas Exhibition, as per London "Gas Journal," May 10, 1881.

	ALDER & MACKAY.	W. & B. COWAN.	G. GLOVER & Co.	JAMES KEITH.	D. B. PEEBLES & Co.
Total of Fast Tests . .	47·2 ..	6·9 ..	33·6 ..	62·3 ..	53·7
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Descriptive Circulars, Price Lists, and Full Particulars forwarded on application.

NEW GRANGE WORKS, EDINBURGH.

PHILADELPHIA EXHIBITION, 1876.

ALSO SILVER MEDAL, PARIS.

The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

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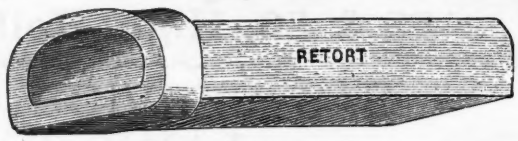

Proprietors of

STOURBRIDGE CLAYS,

Manufacturers of

Fire-Bricks, Tank Blocks, Glass-House Bricks and Pots, Gas-Retorts, Crucibles in Clay and Plumbago, Gas-Oven Bricks, Bricks for Regenerator Furnaces and Hot-Air Stoves.

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N.B.—Gas, Blast-Furnace, and Glass-House Bricks and Glass-House Pots always in Stock, or made on the Shortest Notice.

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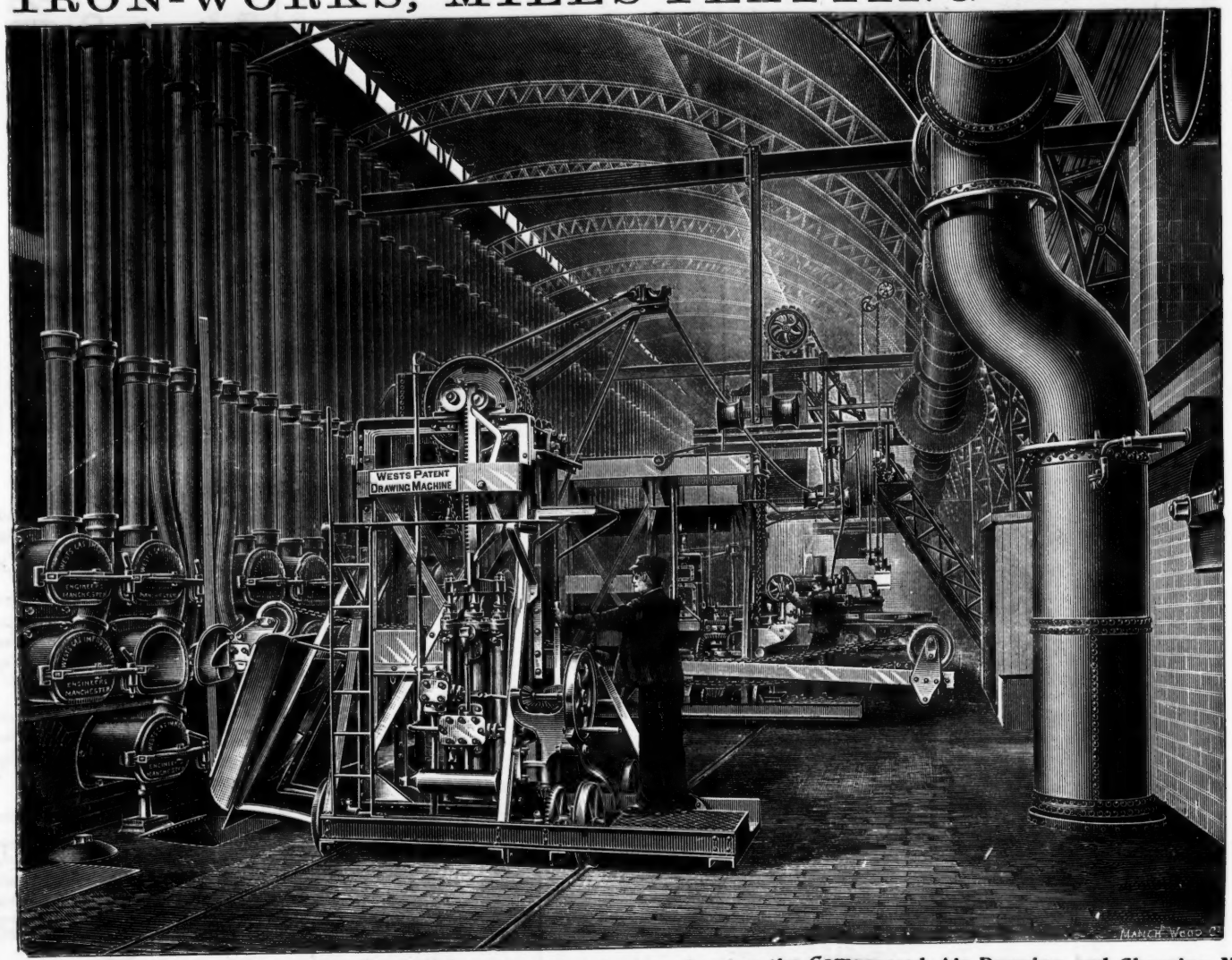

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

104, Queen Victoria St.,

LONDON, E.C.

OVER

560,000

LINEAL

FEET

OF

RETORTS

DAILY

ARE CHARGED

AND DRAWN BY

WEST'S

MACHINES.

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BIRMINGHAM.

MANUFACTURERS OF GASELIERS IN GLASS AND METAL.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

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The Climax of Regenerative Gas Lighting!!

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"VERTMARCHE"

A 280-CANDLE POWER PLAIN IRON LAMP,

CLASS A— 55/-

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

Manufactured in England.

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153 & 155, CANNON STREET, LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

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MANUFACTURERS OF

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Established 1860.

OXIDE OF IRON.

NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

Wm. H. MÜLLER & CO.,

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TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

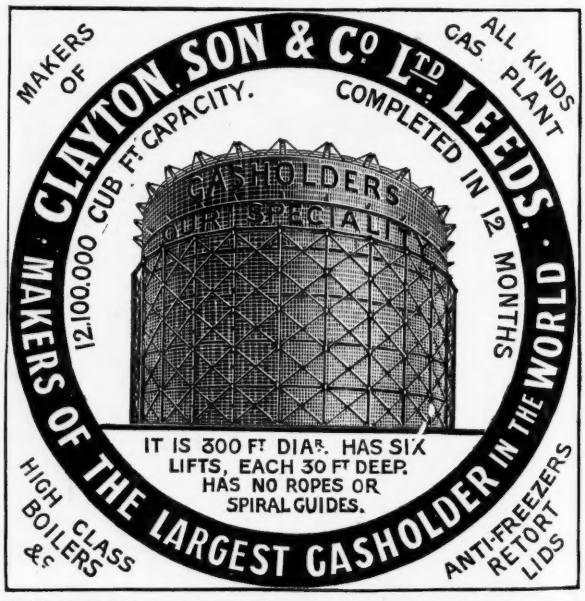
WORTLEY FIRE-CLAY WORKS, Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
OTHER SPECIALITIES
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.

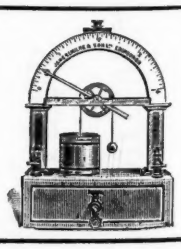
Telegraphic Addresses: "GAS LEEDS" "ECLARAGE, LONDON."

JAMES MILNE & SON, LTD.,

GAS ENGINEERS,

MILTON HOUSE WORKS, EDINBURGH.

LONDON. — GLASGOW. — LEEDS.



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IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

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The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.
WIDNES.
HALIFAX.
ALTRINCHAM.
DENTON.
ST. ALBANS.
DUKINFIELD.
NORTHWICH.
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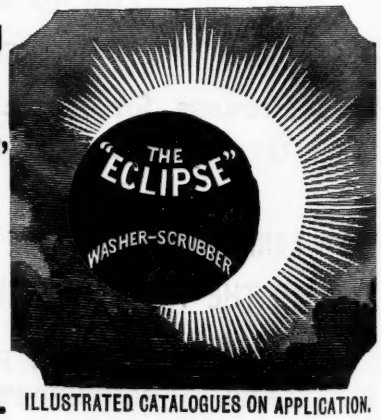

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